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Parental understanding of preschool children's physical activity and sedentary behaviour
Implications for guidelines and policy

Parental understanding of preschool children's physical activity and sedentary behaviour: Implications for guidelines and policy

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ABSTRACT

Higher physical activity and lower time in sedentary behaviour in the preschool years are associated with improved health outcomes. Evidence of whether UK preschool children are achieving the national physical activity guidelines is conflicting. There is a lack of evidence on how parents view their child's physical activity and sedentary behaviours and how they can best support their children to meet national guidelines. The overall aim of this PhD thesis was to explore how parents can be supported to understand and increase their preschool child's physical activity and reduce their sedentary behaviours.

The thesis is based on three inter-connected studies. In Study 1, interviews with mothers identified several issues that prevented them from relating to the current UK physical activity and sedentary behaviour guidelines for preschool children. In study 2, focus groups with parents, that included a nominal group technique methodology, were held to identify potential terminology and activity examples that could be used to describe and illustrate different physical activity intensities in preschool children to parents. The results of this study produced the terms Still, Pottering, On-the-Go, and Huff and Puff to describe different physical activity intensities. In study 3, results of an online survey with parents showed that these four terms were acceptable to them. Findings from the focus groups and online survey suggested that preschools and nurseries were favoured and respected sources of information by most participants. Health professionals and social media were other positive channels for dissemination.

The main findings from this thesis suggest that parents are not aware of the physical activity and sedentary behaviour guidelines for preschool children and have difficulty in interpreting them. Future research could explore the views of fathers and ethnic minority groups and assess whether presenting and communicating guideline information as suggested in this thesis makes it more accessible to parents.

Author’s declaration

I declare that the work in this dissertation was carried out in accordance with the requirements of the University's Regulations and Code of Practice for Research Degree Programmes and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Work done in collaboration with, or with the assistance of, others, is indicated as such. Any views expressed in the dissertation are those of the author.

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Publications from this thesis

Publications:

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Bentley, G, Jago R., Turner KM. (2015) Mothers' perceptions of the UK physical activity and sedentary behaviour guidelines for the early years (Start Active, Stay Active). International Society of Behavioural Nutrition and Physical Activity Annual Meeting, Edinburgh, UK

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Abbreviations

BMI =	Body mass index
CMO =	Chief Medical Officer
DHSC =	Department of Health and Social Care
IMD =	Index of multiple deprivation
LPA =	Light intensity physical activity
METs =	Metabolic equivalent units
MPA =	Moderate intensity physical activity
MVPA =	Moderate to vigorous intensity physical activity
P =	Probability value
PA =	Physical activity
SB =	Sedentary behaviour
SD =	Standard deviation
SES =	Social economic status
UK =	United Kingdom
VPA =	Vigorous intensity physical activity
WHO =	World Health Organisation

CHAPTER 1. INTRODUCTION

The preschool years are an essential time for promoting healthy physical activity and discouraging sedentary behaviours[1]. Research of the health impact of physical activity and sedentary behaviour in this age group is a rapidly expanding field[2 3] and is providing evidence that low levels of physical activity and high levels of sedentary behaviour are associated with a number of adverse health and developmental outcomes[2-4]. In addition, physical activity and sedentary behaviours are thought to track from preschool to childhood and subsequently into adulthood[5-8], highlighting the importance of establishing optimal activity behaviours within this period. Accordingly, many nations have produced physical activity guidelines for the early years; a time period that includes the preschool age group. In 2011, the joint Chief Medical Officers' report "Start Active, Stay Active" provided physical activity and sedentary behaviour guidelines for the early years for the first time in the United Kingdom (UK) [9]. Evidence of whether UK preschool children are achieving the physical activity recommendations is inconclusive[10 11]. However, there is increasing evidence to suggest that preschool children spend an excessive amount of time being sedentary[12 13].

Preschool children's behaviours are greatly influenced by their parents. Many aspects of parenting, including parenting style, parental monitoring, parental knowledge, and parents' perceptions of their child's physical activity behaviours, have all been reported as positively correlating with children's physical activity[14-17]. Therefore, parents provide a significant and important role in the lifestyle habits of their preschool child. Parents' knowledge or understanding of the physical activity and sedentary behaviour guidelines

for the early years is not known. Awareness of the physical activity recommendations[18], and an awareness of how ones activity compares to those recommendations[19 20], may be important for behaviour change.

1.1. Definitions of terms

Physical activity can be defined as: *"any bodily movement produced by skeletal muscles that results in energy expenditure"*[21] (P.126). Physical activity is typically categorised into intensity categories of light, moderate and vigorous intensities, with moderate and vigorous commonly being categorised together (MVPA). These intensity categories refer to the rate in which the activity is being carried out and are defined by values of metabolic equivalent units (METs). The MET value is the ratio of a person's working metabolic rate relative to their resting metabolic rate[22]. Light intensity physical activities (1.5 – 2.9 METs) for preschool children include activities such as dressing up, standing play, and slow walking. Moderate-to-vigorous intensity physical activities (3-8 METs) include higher intensity activity, such as running, jumping and playing ball games[23]. Preschool children's natural activity patterns are sporadic, and are characterised by intense bursts of activity followed by periods of rest or lower intensity activity[24]. For preschool children, the primary form of physical activity is through play[25], which may occur at various intensities but mostly fluctuates between sedentary and light intensity activity with sporadic bouts of higher intensity activity[26]. Play can be defined as an activity that is freely chosen, intrinsically motivated, often appears purposeless, and is for personal enjoyment[27 28]. Play fulfils an inherent functional need in children, and is crucial for healthy physical, intellectual and social development[29]. In addition to play,

preschool children acquire physical activity through incidental movement behaviours, such as dressing and active transport (e.g. walking or scooting)[29].

Sedentary behaviour can be defined as any waking behaviour associated with an energy expenditure of ≤1.5 METs and a sitting or reclining posture[30 31]. Sedentary behaviour is not considered an absence of physical activity but is a separate behavioural construct with determinants independent to physical activity[30]. It is recognised that too much sedentary behaviour can have negative health effects, which are distinct from those that result from low physical activity[32 33]. For preschool children, sedentary behaviour typically comes in the form of floor-based or seated play (e.g. jigsaws, object play, drawing and crafts), screen-viewing or being restrained in a car seat or pushchair[34]. Screen-viewing for preschool children mainly consists of television viewing, but also includes computer use and increasingly, the use of touchscreen mobile devices (e.g. smart phones, tablets, and e-readers).

In the UK, the definition of the preschool period is generally accepted to be between the ages of three years up until start of formal schooling, which in the UK is the year of their fifth birthday[35]. However, research commonly expands the preschool age range to include two-year olds. To ensure that this thesis is comparable to other research, the definition of 'preschool child' here is a child between the ages of two to five years. In line with the UK physical activity and sedentary behaviour guidelines[9], the term 'early years' refers to children between the birth and five years of age. Within this thesis, the term 'parent' also includes main carers and guardians.

1.2. Research questions

The overall aim of this PhD thesis was to explore how parents can be supported to increase their preschool child's physical activity and reduce their sedentary behaviours. The following two research questions were developed to address this aim:

> **1:** How can parents be supported to help their preschool child achieve appropriate levels of physical activity and sedentary behaviour?
>
> **2:** How can physical activity and sedentary behaviour guideline information be effectively presented and communicated to parents of preschool children?

1.3. Structure of the thesis

Research for this thesis has taken place over the last six years. The reasons for this extended time period to complete it is because I have taken two breaks for maternity leave and returned after the first maternity leave on a part-time basis. During this six-year period there has been a noticeable increase in research outputs relevant to preschool children's physical activity and sedentary behaviour, and changes in policy and guidelines. The rapid advances in research during my periods away from work meant that the plans for this research needed to respond to new evidence as it occurred.

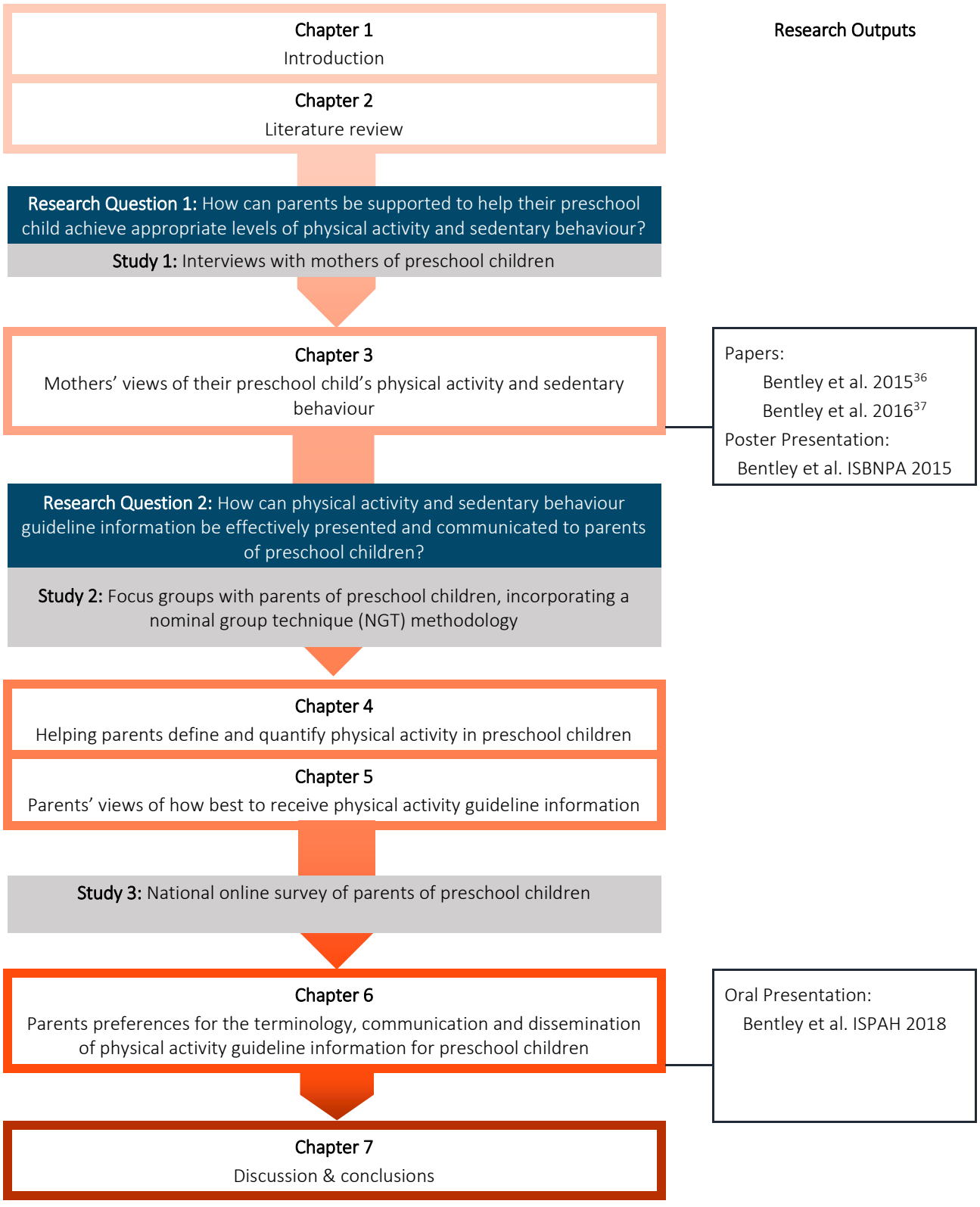
This thesis consists of three studies that take an iterative approach, where the results of one study informed the development of the next. It is organised into eight chapters (Figure 1.1), beginning with a review of the relevant literature (Chapter 2). Chapter 3 presents a qualitative study (Study 1) comprising of interviews with mothers to explore their perception of their preschool child's physical activity and sedentary behaviours in

relation to the UK physical activity and sedentary behaviour guidelines Start Active, Stay Active. The results of this study identified issues with the way parents interpret and respond to physical activity guideline information. This informed the focus of the Study 2, that aimed to gain an understanding of how the UK physical activity and sedentary behaviour guidelines could be better communicated and disseminated to parents. Chapters 4 and 5 present the methods and findings of Study 2, which comprised of focus groups with parents utilising a nominal group technique. Chapter 6 presents a national online survey (Study 3) that aimed to assess the results of Study 2 with a larger and more diverse sample of participants. The concluding chapter (Chapter 7) draws together the main findings of the thesis, details their implications for policy and future research, the thesis's limitations and conclusions.

Researcher Positionality

As mentioned above, I was not a parent when I started my PhD studies in November 2012, but shortly after I became a mother, having my first child in July 2013. I had another child in 2017. I acknowledge that this transition to motherhood, and my experiences of raising young children shaped the research process within this thesis. During the development of my initial PhD proposal, my understanding of the subject of preschool children's physical activity and sedentary behaviour was based on previous research with parents of young children. I was an outsider looking in. However, after becoming a parent I had my own first hand experiences of the concepts raised within this research. Thus, throughout this thesis I have included reflexivity statements that reflect how my personal situation at the time the research was carried out may have been influential to the research process.

Figure 1.1 Outline of thesis



CHAPTER 2. LITERATURE REVIEW

2.1. Overview

In this chapter, research literature relevant to this thesis is reviewed. As noted in the introduction, the two broad research questions for this thesis were:

> **1:** How can parents be supported to help their preschool child achieve appropriate levels of physical activity and sedentary behaviour?
>
> **2:** How can physical activity and sedentary behaviour guideline information be effectively presented and communicated to parents of preschool children?

As such, the literature review is focused on physical activity and sedentary behaviours within the preschool years. It begins by providing a rationale for the focus on these behaviours in the early years by outlining the role of physical activity and sedentary behaviour in the health and development of preschool children. The current UK recommendations for physical activity and sedentary behaviour are then discussed and compared to other international guidelines. Preschool children's physical activity and sedentary behaviour levels are reviewed in relation to the current UK guidelines. In section 2.6, correlates and determinants of these behaviours in preschool children are discussed. The final section addresses how this information applies to UK public health policy.

2.2. Method

Several bibliographic databases were used to identify relevant literature, including Ovid MEDLINE, Ovid EMBASE, Ovid psycINFO and Cochrane Central Database. Different

combinations of keywords were used for each of the four sections of the review, these are presented in Table 2.1. Each search started by looking for relevant meta-analysis that had synthesised data in the subject area. Where no recent meta-analysis were available, recent large cohorts and trials were identified and reviewed. Only articles written in English were considered.

Table 2.1. Keywords for the four searches carried out for this literature review

Search 1: Preschool children's physical activity, sedentary behaviour and health and development		
1. Preschool 2. Nursery 3. Early years 4. Early childhood 5. Children 6. Young child* 7. Kindergarten	8. Physical activity 9. Active play 10. Fitness 11. Exercise 12. Motor activity 13. Sedentary 14. Screen viewing 15. Screen time 16. Television	17. Health indicators 18. Health outcomes 19. Obesity 20. Overweight 21. Body mass 22. Adiposity 23. Cardiometabolic health 24. Bone health 25. Development 26. Movement skills 27. Motor skill 28. Cognitive development 29. Psychosocial 30. Sleep
Search 2: Physical activity and sedentary behaviour guidelines for preschool children		
1. Preschool 2. Nursery 3. Early years 4. Early childhood 5. Children 6. Young child* 7. Kindergarten	8. Physical activity 9. Sedentary 10. Screen viewing 11. Screen time	12. Guidelines 13. Recommendations 14. Targets

Search 3: Preschool children's physical activity and sedentary behaviour levels		
1. Preschool 2. Nursery 3. Early years 4. Early childhood 5. Children 6. Young child* 7. Kindergarten	8. Physical activity 9. Active Play 10. Exercise 11. Sedentary 12. Screen viewing 13. Screen time 14. Television	15. Levels 16. Compliance 17. Adherence 18. Patterns 19. Prevalence 20. Measure 21. Assessment
Search 4: Correlates and determinants of physical activity and sedentary behaviour in preschool children		
1. Preschool 2. Nursery 3. Early years 4. Early childhood 5. Children 6. Young child* 7. Kindergarten	8. Physical activity 9. Active play 10. Fitness 11. Exercise 12. Motor activity 13. Sedentary 14. Screen viewing 15. Screen time 16. Television	17. Correlates 18. Determinants 19. Associated 20. Predictor 21. Influences

2.3. Preschool children's physical activity, sedentary behaviour and health and development

The literature reviews in this area was sub-divided into research on physical activity and sedentary behaviour. These are presented below.

2.3.1. Physical activity, health and development

Physical activity is one of several factors that influence the healthy child development (the sequence of physical, cognitive and social changes that occur from birth to the beginning of adulthood[38]) [39]. Higher levels of physical activity during early childhood, in particular moderate to vigorous physical activity (MVPA) and total physical activity

(TPA), have been associated with a number of favourable health outcomes[2 40], including improved cardiometabolic health indicators[2 25 40 41], bone and skeletal health[42 2 40], cognitive development[2 43], and motor skill development[2 40 44 45]. Two systematic reviews of physical activity and health indicators in the early years (0 to 5 years) were identified, published in 2012[40] and 2017[2]. Both reviews found that physical activity was positively associated with cognitive development, psychosocial health, motor development, bone and skeletal health, and cardiometabolic health.

In the UK, almost one in four children aged five years are overweight or obese [46]. Low levels of physical activity have been attributed to increasing rates of obesity in young children[24], and there is some evidence to suggest that increased physical activity reduces the risk of obesity in preschool children[47 48]. However, more recent systematic reviews of the relationship between physical activity and health indicators in young children have reported inconsistent associations between physical activity and obesity measures[2 40]. For instance, a review by Carson et al[2], reported that a meta-analysis of four intervention studies (total of 1100 participants) found no significant differences between intervention and control group body mass index (BMI) (weighted mean difference = -0.04 kg/m^2; 95% CI -0.12,0.03). Strong associations have, however, been reported between physical activity and measures of obesity in older children (aged 5-17 years)[49]. This may be because of the small inter-individual variability in obesity data for preschool children. Alternatively, it could be that the preschool years are too early to detect excess adiposity, as there is an indication that as obesity increases with age and associations may be compounded by adiposity rebound[50]. There is evidence to suggest higher levels of physical activity in early childhood have a protective affect against

increases in BMI in older childhood[40]. Thus, regardless of whether physical activity is directly associated with measures of obesity in preschool aged children, encouraging increased physical activity to maintain healthy weight in preschool children is worthwhile.

2.3.2. Sedentary behaviour, health and development

Although sedentary behaviour in preschool children may occur in a number of activities, screen-viewing (especially television viewing) is commonly used as a proxy measure for sedentary behaviour. For preschool children, screen-viewing mainly consists of television viewing but can also include computer use and, increasingly, the use of touchscreen mobile devices [51]. The current information on the associations between television viewing and health outcomes among preschool children is mixed. For instance, it remains unclear if television viewing is associated with overweight and obesity [48 52-61], and poorer or improved academic skill development [54 62 63] in young children (under the age of 6 years). There is evidence of associations between television viewing and lower levels of physical activity [54 64], cardiometabolic risk factors [59 65-67], shorter sleep duration [68-71], adverse dietary outcomes [54 72], and poorer outcomes for psychosocial wellbeing,[60 73-75] in young children. In general, however, more work is needed to understand these associations and particularly the extent to which associations could be explained by other factors such as parental sedentary habits [76].

Studies of school-aged children have identified screen-viewing as a ritualised behaviour, highlighting the importance of establishing appropriate screen-viewing

behaviours early in childhood in order for them to become habits in later life [77]. Thus, there is a need to establish healthy patterns of behaviour during the early years in order to protect against possible health detriments in the future.

2.3.3. Combination of movement behaviours

As discussed in greater detail below (section 2.4), there has recently been an interest in the combination and interaction of movement behaviours that include physical activity (light to vigorous intensity), sedentary behaviour and sleep with the overall health of preschool aged children[78-82]. For example, adherence to the recommendations for all three movement behaviours has been associated with improved measures for social cognition (mean difference = 0.28; 95% CI = -0.002, 0.48) in a cross sectional study of 248 preschool children[79]. A systematic review on the relationship between combinations of movement behaviours and health indicators in children aged from birth to four years[83], found that the combination of favourable physical activity and sedentary behaviour levels were associated with positive measures of motor development and fitness among preschool children. However, there was no evidence in this review of associations between compliance with the 24-hour movement recommendations and overweight or obesity in preschool children. The lack of association between combined movement behaviours and measures of obesity have also been reported in studies published since this review. For example, in a study of 4 and 5 year olds in Sweden, there were no evidence of a difference in the likelihood of being overweight or obese between children who met the 24-hour-movement guidelines and those that did not (OR 0.85, 95% CI 0.39, 1.87) after adjustment for sex, parental education level, and accelerometer wear time[81]. Furthermore, a lack of association was also reported from a

study assessing compliance with the 24-hour movement guidelines and overweight or obesity in 3 and 4 year old children in Canada (OR 0.76, 95% CI 0.37-1.57)[82]. However, positive associations have been reported in older children. For instance, in a cross-sectional study combining results of 12 countries it was reported that children (aged 9-11 years) who meet the three recommendations are 72% less likely to be obese than those who do not meet them[84]. In addition, meeting the 24-hour movement guidelines was associated with health indicators in children aged 6 to 17 years[78], including lower BMI z score (β 0.36, 95% CI 0.19, 0.54), waist circumference (β 0.04, 95% CI 0.02, 0.07), higher aerobic fitness (β -14.05, 95% CI -20.89,-7.21), lower blood-pressure (β 0.18, 95% CI 0.07, 0.28) and lower insulin (β0.19, 95% CI 0.04,0.34). Collectively, this evidence suggests that movement behaviours could become important as children age, with preschool an age when behaviours are established.

2.4. Physical activity and sedentary behaviour guidelines for preschool children

In light of increasing evidence of the role of physical activity and sedentary behaviour in the healthy development and wellbeing of young children, a number of nations (namely Australia[85] , Canada[86] , USA,[87] and the UK[9]) have produced physical activity and sedentary behaviour guidelines for the early years (0-5 years). In the UK, the Chief Medical Officers (CMOs) published physical activity and sedentary behaviour guidelines for the early-years (from birth to 5 years) for the first time in 2011[9]. These were the first physical activity guidelines that provided a common set of recommendations for all countries in the UK. The guidelines are aimed at the NHS, local authorities and a range of other organisations designing services to promote

physical activity, sport and exercise for health benefits. The current UK guidelines state that children under the age of five who can walk unaided should be physically active for at least 180 minutes each day, throughout the day. This physical activity can be of any intensity, i.e. light to vigorous. The guidelines define activity in the under-fives as any activity that involves moving the trunk, and more exertion than the minimal movement required to carry out everyday tasks, such as washing and dressing or passive play (e.g. craft activities, dressing up or playing at a sand table)[88]. The sedentary behaviour guidelines advise that for both children who can and cannot walk, extended periods of sedentary time should be minimised (except sleeping). The guidelines emphasise that time spent screen-viewing and restrained in car seats, highchairs or pushchairs are the targeted behaviours to be reduced. In the UK, there are no specific government guidelines for daily screen-time for the early years, only that screen-viewing should be minimised. The Australian[85] and Canadian[86] guidelines suggest that children between 2 and 5 years of age should have less than 1 hour of screen-time per day.

More recently there has been a shift towards a holistic view of movement behaviours across the whole day, and a 24-hour integrated movement behaviour approach has been adopted by guidelines produced in Canada[86] and Australia[85] that include recommendations for physical activity (of all intensities), sedentary behaviour, and sleep. The basis of this approach is that these three behaviours are relevant components within the context of a 24-hour movement continuum[89]. These individual movement behaviours should be considered in relation to each other because of their combined association with health indicators [83 86]. Canada were the first nation to produce 24-hour movement guidelines for the early years in 2017, which were formed after an intensive

development process that included four systematic reviews, a review of the cost effectiveness and resource use associated with implementation, a stakeholder survey, key informant interviews and focus groups[80]. As well as recommendations on time spent in physical activity and sedentary behaviour, the new guidelines also include a recommended quantity of sleep. The Australian 24-hour movement guidelines for the early years were published later in 2017 using the research provided by the Canadian guidelines[85 90]. During the development of the Australian guidelines, the Canadian guidelines were assessed with a structured development and evaluation framework, systematic reviews were updated and further qualitative research was carried out[90]. As a result, the Canadian recommendations were adopted by the Australian government with little alteration. The current Canadian and Australian physical activity guidelines for preschool aged children (3-4 years) are presented in Table 2.2.

Table 2.2 Outline of the Canadian and Australian 24-hour movement guidelines for preschool aged children (3-4 years)[85 86]

Physical activity	At least 180 minutes spent in a variety of physical activities spread throughout the day, of which at least 60 minutes is energetic play – more is better
Sedentary behaviour	Not being restrained for more than 1 hour at a time (e.g. in a stroller or car seat) or sitting for extended periods. Sedentary screen time should be no more than 1 hour – less is better. When sedentary, engaging in pursuits such as reading, singing, puzzles and storytelling with a caregiver is encouraged.
Sleep	10 to 13 hours of good-quality sleep, which may include a nap, with consistent bedtimes and wake-times

The UK are currently revising the guidelines for the early years, which are expected to be published in 2019[91]. The draft recommendations, made publicly available in the summer of 2018, also take a 24-hour movement guideline approach[88]. The Canadian 24-Hour Movement Guidelines for the Early Years (0-4 years)[86] form the basis of the new UK recommendations. 'The WHO Guidelines Development Group for integrated 24-hour movement in young children: physical activity, sedentary behaviour and sleep time in children under five years of age' fed into the development of the UK guidelines in order to update and extend the Canadian literature searches[88]. Like the current UK guidelines, the draft guidelines recommend 180 minutes of physical activity spread throughout the day. However, they now also include a recommendation for at least 60 minutes of MVPA per day to be included in the 180 minutes. The sedentary time recommendation has been updated to include a recommended screen-time limit of up to 1 hour per day, less is better. There is also the new addition of a recommendation of sleep time, which recommends 10 to 13 hours of good quality sleep.

2.5. Preschool children's physical activity and sedentary behaviour levels

Evidence of whether preschool children are achieving the 180 minutes physical activity per day is conflicting, with a wide variation in mean daily physical activity between studies. A meta-analysis of 29 studies reporting accelerometer-derived estimates of daily MVPA in children aged 3 to 5 years old concluded that because of the large disparity in methodology between studies, preschool aged children may or may not be sufficiently activity [92]. Interpreting accelerometer-derived physical activity levels is extremely problematic because of the inconsistency of cut-points applied within each

study. This resulted in a wide variation in accelerometer-derived MVPA levels and estimates from analyses indicated that preschool-aged children accumulate an average of between 40 to 100 minutes of MVPA per day.

In the UK, a study by Hesketh et al.[10] used accelerometry to measure physical activity levels during preschool and home. They reported that UK preschool children were active (TPA) for 568.5 (SD 79.5) minutes per day, with MPVA accounting for 69.6 (SD 30.7) minutes per day. This is much higher than results from an earlier study by O'Dwyer et al.[93] that aimed to compare activity levels in a small sample of overweight and non-overweight UK preschool children. Boys in the non-overweight group achieved 45.2 ± 20.3 minutes and 38.0 ± 10.4 minutes of MVPA on weekdays and weekends respectively. Girls in the non-overweight group achieved 43.3 ± 17.0 minutes and 42.4 ± 26.4 minutes of MVPA on weekdays and weekend respectively. It was reported that very few children accumulated 60 minutes of MVPA in the day (0% children in the overweight group and 25% boys and 15% girls in the non-overweight group on weekdays)[11]. As well as the slightly differing age groups, the inconsistency in levels of MVPA from these two studies again may reflect the differing methodology used to collect accelerometer data. Specifically, differences in activity monitors (Actiheart Vs Actigraph), cut-points of counts per minutes (CPM) used to determine MVPA (Hesketh et al., ≥400 CPM; O'Dwyer et al., 272-412 CPM) and epoch intervals (Hesketh et al., 60 second epochs; O'Dwyer et al., 5 second epochs) means caution is needed when comparing the results of these studies.

There is evidence that preschool children exhibit high levels of sedentary behaviour[94]. For example, one UK study reported that preschool children are sedentary for nearly half to their waking hours [95]. Sedentary behaviour in young children is usually reported as a measure of screen-viewing and in particular television viewing[96]. The Health Survey for England [12] reported that TV watching makes up 54% of boys and 52% of girls total sedentary time at age 2, and 57% of boys and 56% of girls at age 5. This indicates that TV watching accounts for a considerable amount of a preschool child's day. Jago et al. (2013) found that in survey of 252 preschool children in the UK, two thirds were watching 2 or more hours of television per day[13]. In Australia, a study of children aged 3 to 5 years old reported that boys watched an average of 114.8 minutes per day and girls 109.7 minutes per day [97]. A study of 8950 preschool children in the US also reported high levels of screen-viewing (mean 4.1 hours of screen-time daily), which almost entirely occurred within the home (3.6 hours) – even for children who attended day care, highlighting the role of parents in children's exposure to screens[98]. Collectively, these studies provide evidence of the key role of screen-time on the overall movement behaviour and particularly sedentary time of pre-school aged children.

Since the publication of the 24-hour movement guidelines for preschool children by Canada, several studies have reported prevalence of the combination of movement behaviours; physical activity, sedentary behaviour, and sleep. Currently there is no data available from the UK. However, a cross-section study of 4 and 5 year olds in Sweden reported that 31% met the MVPA recommendation, 63% met the screen-time recommendation and 98% met the sleep guidelines[81]. On average, 18.4% of the total study sample met the recommendations for all three behaviours. In Canada[82] and

Australia[99], just 12.7% and 14.2% of preschool children met all three recommendations. There was a high compliance to the sleep recommendation (83.9% in Canada and 88.6% in Australia met the 10-13 hour sleep recommendation). A higher proportion of preschool children were meeting the guidelines for physical activity in these studies than have been previously reported. In Canada, 61.8% of children met the physical activity guidelines and in Australia 93.1% met the guidelines. It is possible that this reflects the different methodology used to measure physical activity between studies. In addition, in a study of the proportion of children aged 9-11 meeting recommendations of 24 hour movement guidelines from 12 countries, Canada and Australia showed the highest adherence[84], indicating that these figures may not be a reflection of movement behaviour levels in other nations.

The wide variation in study designs and findings means that no clear picture can be drawn regarding typical physical activity levels of preschool children in the UK. However, evidence suggests that physical activity in this age group is at the recommended level for health benefits in most children but also that most preschool children are spending excessive amounts of time screen-viewing and exceed the recommended amounts daily.

2.6. Correlates and determinants of physical activity and sedentary behaviour in preschool children

This section summarises the research on correlates and determinates of preschool children's physical activity levels (total physical activity [TPA] and moderate to vigorous activity [MVPA]) and sedentary time. The term 'correlate' is used when an

association is identified between an independent variable and physical activity or sedentary time within a cross-sectional study. It does not indicate causality. The term 'determinant' is used when the association is found within a longitudinal study, which allows temporal associations over time to be observed and thus allowing causality to be identified[100].

2.6.1. Correlates and determinants of physical activity in preschool children

Three systematic reviews (published in 2008[101], 2012[102], 2016[103]) have identified a number of correlates of physical activity in preschool children. For example, Bingham et al., reported a positive correlation between TPA and the sex of the child (male), parental physical activity, parental support for physical activity, and time outdoors[103]. Most correlates and determinants of physical activity in preschool children are unmodifiable factors. For instance, a recent longitudinal assessment of determinants of physical activity and preschool children using data from the Swiss Preschoolers' Health Study (SPLASHY)[104], reported that non-modifiable factors, such as the sex (β=46.7, 95% CI = 24.4,68.9) and age (β = 32.5, 95% CI 12.4,52.6) of the child, the child's activity temperament (β = 30.6, 95% CI = 12.7, 48.5), and family structure (β = 50.8, 95% CI 6.1,95.6), had the greatest influence on physical activity[104]. The child's sex is a frequent correlate of physical activity, with boys achieving more daily average TPA and MVPA than girls[101 103 105]. In terms of child's age, reviews previous to the SPLASHY study concluded that there is no association[102 103] or inconsistent association[106] with physical activity. Children's personality and natural desire to be active may influence their physical activity levels, for instance children being the initiator of activities and

their preference for active play was associated with TPA and MVPA in one review[103]. Outdoor variables, such as time spent in play spaces outdoors and the presence of public open spaces and playgrounds, were positively correlated with children's physical activity levels in three reviews[101-103].

Parents appear to be an important influence on child physical activity behaviour [15 16 107], and parenting factors (e.g. parenting style) have been identified as one of the few modifiable associations with preschool children's physical activity. Parental physical activity levels, parent's enjoyment of physical activity, parent's interaction with the preschool child's physical activity behaviours had a positive association with TPA, and having play rules (e.g. no balls in the house) had an inverse association with TPA [16 101-103] However, no association has been found between parental encouragement of physical activity and child's physical activity levels [101]. A systematic review specifically on parenting practices and young children's physical activity reported evidence of a number of associations of parenting practices, including parenting style, parenting perceptions of child's physical activity behaviours, and parental involvement with children's physical activity[16]. Apart from the sex of the child, time playing with parents was the only determinant identified in the systematic review by Bingham et al.,[103] again highlighting the important role parents have in their children's physical activity.

2.6.2. Correlates and determinants of sedentary behaviour in preschool children

As screen-time is typically used as a proxy measure of sedentary time in young children, and there is less research on the correlates of subjectively measured sedentary time, the correlates of screen-viewing rather than sedentary behaviours are mainly reported [108]. In reviews of correlates of sedentary behaviour in preschool children, measures of both screen-time and sedentary time are used to define sedentary behaviour, and so it is difficult to discern the differences in correlations between screen viewing and sedentary time. As sedentary time includes a range of activities other than screen viewing, it may have different correlates associated with it. One study examined correlates of screen-time and sedentary behaviour in preschool children, a greater number of correlates of screen time than sedentary time were identified [108]. This may be attributed to the self-report measurement for screen-viewing and its potential correlates leading to reporting bias, and also that the correlates are less relevant to sedentary behaviour (e.g. parents limiting screen-time) when accelerometry captures many more behaviours beyond that of screen viewing.

As with the study of correlates of physical activity, non-modifiable factors were mostly identified as correlates for sedentary behaviour and screen-viewing. The most frequently investigated correlate was the sex of the child, which was found to have no association with screen viewing[102 108 109] or objectively measured sedentary time[108] within systematic reviews of correlates of sedentary time or screen viewing in preschool children. There were mixed results as to whether ethnicity is related to screen-viewing, where some reviews found no association[102] and others a strong association[109] . The

child's activity temperament has been found to be strongly associated with sedentary behaviour (β=39.6, 95% CI = 18.2,60.9) in a study of sedentary behaviour determinants in preschool children, and it accounted for 20% of the total variance of sedentary behaviour when combined with sex, season, and family structure[104]. This study, and early systematic reviews reported that children's sedentary behaviours may vary according to family structure. For instance, children without siblings have been found to spend more time screen-viewing than children with siblings (β= -38.9, 95% CI = -67.7,-10)[105 109 110] . In addition, children from single parent families spend more time screen-viewing than children from two-parent families (β = -27.5, 95% CI = -43.6, -11.4)[105].

Like physical activity, parental variables are frequently investigated as correlates of screen-viewing behaviours in children and evidence suggests that parents play an important role in children's screen time. Within reviews, moderate evidence was found for parental self-efficacy to limit screen time [16 108], actual rules of screen time [111 108 109], and parents own screen-viewing behaviours as inverse correlations of screen-viewing [16 109] . Other parenting variables, such as parenting style, parental perceptions of their child's screen viewing, and parenting style with screen-viewing were intermediate or indeterminate correlations due to limited studies and contradictory results between studies. No associations were found for family conflict, parental encouragement for watching TV in one review[102]. A cross sectional study of 937 preschool children in Australia, reported correlates of screen-viewing[108]. Several parenting variables were found to be correlated with child's screen-viewing levels, including parental concerns about child's sedentary behaviour (boys β = 4.59, 95% CI = 2.51,6.66; girls β = 7.47 95% CI – 4.90,10.04), parental health knowledge (girls β = -5.65 95% CI= -8.87, -2.44),

and maternal TV viewing (boys β = 3.87, 95% CI = 1.81,5.93; girls β = 2.62, 95% CI = 1.56,3.68). In a combined regressions model adjusted for age, childcare attendance, and clustering by centre of recruitment, the only common correlates for boys and girls screen time in this study were parental self-efficacy to limit screen time (boys β = -6.52, 95% CI -6.51,-3.54; girls β = -2.64, 95% CI 5.12,-0.16) and parental rules to limit screen time (boys β= -5.15, 95% CI -9.20,1.11; girls β= 5.20, 95% CI -9.94,-0.47). This suggests that strategies to reduce screen-time in preschool children would benefit from strategies to implement screen-viewing rules.

2.7. Application to UK public health

The World Health Organisation (WHO) have recently published a new global action plan to promote physical activity (More Active People for a Healthier World)[112], highlighting the need for international action to increase physical activity and reduce sedentary behaviour. It includes policy actions aimed at improving the social, cultural, economic and environmental factors that support physical activity, combined with individual level educational and informational approaches. In the UK, policy changes following this framework may influence activity in preschool children in several ways, such as environmental improvements (e.g. supportive environments for active play) and policy changes within early years' settings. In addition, within the framework is a call to improve awareness and understanding of the importance of an active lifestyle in population groups. The promotion of public awareness (knowledge of their existence) and understanding (knowledge of the guideline information) of the physical activity guidelines has been identified as being key to reducing population levels of physical inactivity [113]. However, existing public health campaigns to promote physical activity

awareness, such as Change4Life, have had limited success in transferring public awareness into meaningful behaviour change[114]. The WHO global action plan fails to progress in understanding how to engage the intended audience. Additionally, it continues to provide an 'top-down' approach that, as discussed further within this thesis, does not engage or endeavour to understand the intended populations needs.

The need to increase physical activity and reduce sedentary behaviour in children features in the UK's government public health policy[9]. This policy includes the publishing and promotion of recommended levels of physical activity and sedentary behaviour. To date there has been no direct promotion of the physical activity guidelines for the early years to UK parents. On release of the Start Active, Stay Active guidelines, there was limited investment into their communication and dissemination, and they were fed into the Change4Life social marketing campaign and NHS Choices website[114]. The Change4Life campaign, introduced in 2009, was England's first national social marketing campaign designed to reduce obesity [115]. It aimed to change behaviour by promoting healthy eating and physical activity at a family level, promoting a motto of 'Eat better, Move more, Live longer'. Whilst the campaign has been successful in reaching families [116], mothers were the main target [115] and the relative impact of Change4Life on behaviour is unclear [117]. Therefore, on release of the new physical activity and sedentary behaviour guidelines for the early years in 2019, information will be needed on how to effectively disseminate the guideline recommendations. No studies have been carried out exploring parental awareness or understanding of the guidelines in the UK, and so there is limited information available to improve the effectiveness of future dissemination efforts targeting parents.

2.8. Summary

This literature review has highlighted the health benefits of increased physical activity and reduced sedentary time in preschool children. Accelerometer studies have provided information, albeit inconsistent, of physical activity levels in preschool children, and from these studies a clearer picture is being formed of how active preschool children are, when they are physically active and influencers of this physical activity. However, there is very little understanding about what activities are contributing to preschool activity levels and why these activities are being carried out. Further qualitative research is needed in order to address these gaps in our understanding of preschool children's physical activity behaviours.

Many of the influences of physical activity and sedentary behaviour identified in the review are not modifiable (e.g. child sex, child age, child preferences for active play). Parents play a key role in the physical activity and sedentary behaviours of preschool children and are one of the few modifiable factors associated with these two behaviours. Little research is available on how parents view their child's physical activity and sedentary behaviours, and how they can best support preschool children to make positive changes. Awareness and understanding of physical activity and sedentary behaviour guidelines may be a key initial step towards behaviour change. However, the current UK physical activity and sedentary behaviour guidelines for the early years have not been actively promoted to parents of preschool children. Parents' knowledge of the physical activity and sedentary behaviour guidelines is not currently understood. This study will address these issues by exploring parents' understanding of their preschool

child's physical activity and sedentary behaviours, and parental preferences for the communication and dissemination of physical activity and sedentary behaviour guidelines.

CHAPTER 3. MOTHERS' PERCEPTIONS OF THEIR PRESCHOOL CHILD'S PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOURS IN RELATION TO THE UK GUIDELINES

3.1. Introduction

Despite the important role parents have in influencing their preschool child's behaviour, there is a paucity of research on the physical activity and sedentary behaviours of preschool children within the home environment, with the majority of research being carried out in the childcare settings (i.e. preschools and nurseries)[118]. To date, no study has examined mothers' perceptions of the UK physical activity and sedentary behaviour guidelines for the early years. Therefore, to understand how parents can be supported to encourage their preschool children to meet the guidelines, it is important to understand parents' views towards these behaviours and whether they view the UK guidelines as realistic and appropriate. The first study conducted in this thesis (referred to as Study 1) had the following study objectives:

- Understand mothers' views of their preschool child's physical activity and sedentary behaviours
- Explore mothers' views of the UK physical activity guidelines for the early years
- Identify opportunities for intervention to improve physical activity and sedentary behaviour in preschool children

Two papers have been published from Study 1. The first paper reported mothers' perceptions of the UK physical activity and sedentary behaviour guidelines for the early years[36]. Whilst analysing the data it became evident that screen-viewing played in important role in preschool children's sedentary behaviour, especially in the form of newer mobile technologies such as smart phones and tablets. There a paucity of published research reporting parents' views of preschool children's use of mobile devices within the home setting, and so a second paper was published focusing on screen-viewing in preschool children with an emphasis on these newer devices[37]. Published papers can be found in appendix 16.

3.2. Methods

Semi-structured interviews were held with mothers of preschool children (aged 2 years up until they commenced formal schooling or the age of 5 years). Only mothers were recruited to this study as they tend to be the main caregiver. The study was approved by the University of Bristol, Faculty of Medicine and Dentistry ethics committee (Ref: 121348).

3.2.1. Recruitment and sampling

Mothers were recruited to the study from four areas that varied in socio-economic status (SES). This was done in case personal situation and location influenced parents' views of physical activity and sedentary behaviour. SES was defined by tertiles of the 2010 index of multiple deprivation (IMD)[119] assessed by residential postcode. The IMD ranks every small area in England from 1 (most deprived area) to 32,844 (least deprived area). Estimates of deprivation are based on indicators of income, health, education and

employment status[119]. One urban neighbourhood from each of the first, second and third tertile of the IMD within the City of Bristol, UK, and one rural neighbourhood south of Bristol (second tertile of IMD) were targeted for recruitment.

The managers of preschools, nurseries, children's centres and parent-child groups in these four areas were contacted to gain permission for the researcher to speak directly to mothers attending their centre or group. Fourteen centres/groups were approached. Of these, eight allowed face-to-face recruitment with mothers and a further three allowed information to be given to mothers via centre staff. For face-to-face recruitment, information about the study was given via posters and leaflets (Appendix 1) at least one week prior to recruitment. The researcher approached mothers face-to-face either during the group time or at child pick-up/drop-off time. Mothers were provided with a study information sheet (Appendix 2) and asked if they would be willing to take part in a one-to-one interview. They were given time to read the information sheet and asked to return a signed consent form to the researcher, via a pre-paid envelope, if they were willing to take part. Once the consent form (Appendix 3) had been received by the researcher, mothers were contacted via telephone to arrange the interview. Mothers were eligible to take part if they were the main or joint carer for a preschool child and could speak English.

Forty-two mothers verbally agreed to take part in the study (9 from an urban high SES area, 12 from an urban mid SES area, 8 from an urban low SES area and 13 from a rural mid SES area). Forty of these women were approached via face-to-face recruitment,

and two contacted the researcher after reading an information sheet. Interviews were arranged at a time and place that was convenient for the mother. Those who were unable or unwilling to meet face-to-face were offered the option of a telephone interview.

3.2.2. Data collection

Three mothers dropped out of the study when contacted to arrange an interview (1 high SES, 2 rural), and a further four participants did not turn up to interview (2 low SES, 1 mid SES, 1 rural). Two of these interviews were to be held over the phone, one was scheduled to take place within a children's centre, and one at the participant's home. Most of the interviews were held between April and June 2013, and a further four were undertaken in May 2014. The last four interviews were held because initial analyses indicated that data saturation had not been met. The time delay in conducting these interviews was due to the researcher being on maternity leave. A semi-structured topic guide (Appendix 4) was used to ensure consistency across the interviews. It covered the following areas:

1. Details of their family and their preschool child's personality
2. Participants' views on their child's physical activity and sedentary behaviour behaviours. This involved discussions around their child's daily activities, within and outside of the home, and their screen-viewing behaviours.
3. Participants' views on the UK physical activity and sedentary behaviour guidelines for the early years.

When discussing the guidelines with parents, first the researcher asked participants if they knew of the UK physical activity and sedentary behaviour guidelines for preschool

children. Using the Department of Health and Social Care's (DHSM) Start Active, Stay Active Fact Sheet 1: Early Years (Under 5's capable of walking)[120] (Appendix 5), the main physical activity and sedentary behaviour targets (i.e. 180 minutes (3 hours) of physical activity per day and a reduction in sedentary time) were given to participants, who were then asked to discuss their views on them. A further explanation was then given of the detail physical activity and sedentary behaviour guidelines (i.e. examples of physical activities included in the guidelines, examples of sedentary behaviours and the benefits of achieving the targets), and participants were again asked to give their views and to discuss them in relation to their preschool child.

3.2.3. Data analysis

Data collection and analysis were undertaken in parallel, so that themes from earlier data collection could inform the focus of later interviews and to establish when data saturation had been reached, i.e. no new themes emerged from the analysis.

Interviews were audio recorded and transcribed verbatim by an external transcription company. Field notes were made by the researcher immediately following each interview. Transcripts and field notes were anonymised before analyses started. Data were analysed using thematic analysis[121]. This initially involved reading and re-reading the interview transcripts in order to gain an overall understanding of mothers' views and experiences and to consider what codes could be applied to the data. The researcher and one supervisor (KMT) then independently read and coded a sample of transcripts. They

then compared their coding and discrepancies were discussed. This discussion led to new codes being developed and existing codes being deleted or defined more clearly.

Transcripts were imported into NVivo (version 10.0, QSR, Southport, UK) to allow for electronic coding and retrieval of data. To assist with the systematic interpretation of the data, an approach based on framework analysis[122] was used. This methodology was selected to assist in the analysis of the data because it enables the organisation of large datasets and assists the researcher to track decisions being made during the analysis and continually link the original data with the findings. This enhances the rigour of the research process. In addition to this, the framework approach enables a simple and effective way to compare and contrast findings between groups (e.g. differences of views between participants of differing SES residences). The Framework approach entailed summarising data pertaining to specific codes in tables. Comparisons were then made within and across the data and deviant cases identified. Once the data had been fully coded, data coded under specific codes were retrieved and overarching or central themes identified.

Throughout the analysis process, analysis and interpretation of the data was discussed with supervisors, and all findings were traceable to sections of transcripts. Quotes reproduced in this chapter have been tagged with the interview number, whether the interviewee resided in the low SES, mid SES, high SES or rural mid SES location, and the sex and age of the child.

3.2.4. Reflexivity Statement

I was pregnant for the majority of the interviews that were carried out in this first study, and the remaining four took place when I returned from maternity leave. My impression was that it was easier to recruit mothers when I was visibly pregnant as I was more approachable during face-to-face recruitment and easier to relate to, with us both being 'mothers'. This highlights the use of finding a way to become approachable to the population group that a project it is targeting for recruitment[123].

Another noticeable impact of my becoming a parent, was on my own personal views and opinions of the subject area. After becoming a parent, I felt I could identify with parents taking part in the research more easily and felt more able to comprehend what they were saying. As such, it became more challenging not to let my own feelings or experiences as a parent interfere with the personal views of the parents taking part in the research. In this case, it was useful discussing with my supervisors when interpreting the results in order to ensure we were reaching impartial agreement.

3.3. Results

Twenty-six interviews were carried out and lasted between 23 and 67 minutes (mean 46 minutes). Two interviews were started but stopped before completion at the request of the participant because of childcare problems. Ten interviews were conducted in the parents' home, three within the location of recruitment, i.e. children's centre, and 13 over the telephone. Three of the mothers had two children of preschool age, in which

case both children were discussed in the interview. Participants' details are provided in *Table 3.1*. Mothers had an average of 2.2 children (ranging from 1 to 4 children), with an age range of 7 months to 14 years.

Results are presented below under four headings based on the main areas covered in the interviews: Knowledge of the guidelines; reactions to the physical activity guidelines; reactions to the sedentary behaviour guidelines; views of the guidelines. Initial analyses showed that preschool children's screen-viewing was a key influence on their physical activity and sedentary behaviours, and so under a heading of 'parents views of their preschool children's screen viewing' results relating to this behaviour are presented in more detail. Analyses showed that mothers from the four areas, and mothers of boys and girls, expressed very similar views.

Table 3.1 Participant characteristics (Mothers N = 26, Children N = 29)

	N	%
Area of recruitment		
Low-SES	5	19.2
Mid-SES	7	26.9
High-SES	8	30.8
Rural Mid-SES	6	23.1
Mothers details		
Lone parent	4	15.4
Mothers employment		
None	16	61.5
Part-time	8	30.8
Full-time	2	7.7
Child details		
Child age (years)		
2	4	13.8
3	15	51.7
4	10	34.5
Child sex		
Female	11	37.9
Male	18	62.1
Only child		
Yes	6	23.1
No	20	76.9

SES = social economic status

3.3.1. Knowledge of the guidelines

Most participants said they were not aware of the physical activity and sedentary behaviour guidelines for preschool children. A few were aware they existed but did not know what the recommendations were. Only one participant had read the guidelines (mid-SES). She had specifically sought out the information as she was keen to find out about obesity prevention strategies for her son.

> *Participant: "Yes it's something that I've been aware of [physical activity guidelines for the early years] because I know I don't, I'm quite bonny [overweight] and my husband's quite overweight… so I think it's made me sort of hyper aware for [Son] and not wanting him to be in the same position that I am".*
>
> *Interviewer: "So it was actually something you actively looked into?"*
>
> *Participant: "Yes, yes." P44, Mid SES, Boy, age 4*

3.3.2. Reactions to the physical activity recommendations

Initially, most participants reported that they felt the target of 180 minutes per day sounded a lot to achieve. However, once it was explained that the 180 minutes could be spread throughout the day and could be of any intensity, most participants commented the guidelines were easily achievable, and some felt that their child exceeded this target. Only two participants (both mothers of girls and from the high SES area) felt their child was not very active. They both said that this was because they felt that their child was predominantly interested in sedentary activities, such as reading or crafts.

"I think she's probably a bit below average in terms of energy; I don't think she's one of those hyper children definitely not because she's always been quite a calm child really in a way. I think really probably she's a quieter kind of child in terms of, she has the energy, but she chooses not to, do you know what I mean she likes to sit and look at a book or something so challenging her mind rather than burning it all off running about I think." P14, High SES, Girl, age 4

There was a general feeling that preschool children were naturally very active, they needed little encouragement to be active. Some participants talked of their child always being busy and doing something, therefore they felt that their child was active. Participants suggested that children need periods of rest because they get tired from their high activity levels.

"I think most children are generally active at that age. I don't, they don't need the encouragement that adults need." P15, Mid SES, Girl, age 3

Screen-viewing was often mentioned as the only time participants' preschool child were sedentary.

"The only time she really sits and doesn't really move is if she's become engrossed in something on the telly or if she's playing with a tablet like playing games or watching something on the tablet, erm otherwise she doesn't really just sit still." P12, High SES, Girl, age 3

Participants defined their child's physical activity using several different examples. These included types of play (e.g. playing with siblings, outdoor play, role play, imaginative play), organised activities and groups (e.g. rugby, swimming, toddler groups), being in formal day care (e.g. nursery or preschool), active transport (walking to and from school, not using the pushchair), and the nature of their personality (e.g. being on the go all the time, not sitting down, taking an active interest in things and asking questions).

> *"He definitely will have had over three hours [of physical activity] because he's been in the garden in the morning and the afternoon he's been at pre-school." P31, High SES, Boy, age 4*

What could be considered as physical activity in preschool children was frequently questioned by participants. Participants explained that their uncertainty in defining physical activity for preschool children, and the sporadic nature of their child's play, made it very difficult to assess how much activity their child did in a day.

> *"It's just when you say physical activity it makes me think I should have her running around in the garden or it sounds like it needs to be something she's really using her body, do you know what I mean?...So, so it's actually the wording, the wording they've used. Has made it sound quite vague, but in reality, it sounds like actually that could be quite achievable just from naturally being a child at that age." P25, Rural Mid SES, Girl, age 3*

> *"It depends on I guess what you say that it [physical activity] actually is. If it is just kind of playing. Yeah, I think it's very difficult at the age to measure it, they're so up and down… It does seem a lot though, but I would think, I have no idea how she compares to that" P10, Low SES, Girl, age 3*

The guidelines state that physical activity can be of any intensity (light to more energetic), but some participants were uncertain what activities would count as physical activity and did not find the examples provided helpful.

> *"Yeah of course running and climbing would be being active, I don't think these examples are very helpful in explaining that then, if you say it can be anything, any intensity. They all sound more energetic." P39, Low SES, Boy, age 3*

Participants felt that the guidelines could be misinterpreted, which may cause unnecessary distress for parents.

> *"But I think it sounds quite daunting as well you know I think you have to qualify what three hours [of physical activity] is because to a lot of people immediately they would assume that you know they might make the wrong assumption that that seems like a lot so to do more is actually quite frightening." P14, Mid SES, Girl, age 4*

Participants felt that increasing their child's physical activity would be difficult. Some explained that their family had busy weekly schedules and there was no time available for additional activities. There was an assumption with many participants that

increasing physical activity would either require additional organised activities, such as attending a preschool group, or being outside in the garden or park.

> *"I don't know how easy it would be though to increase it [physical activity], we do quite a lot… he does normally just get quite tired near the end of the day so I would have thought he is already at his max." P28, Rural Mid SES, Boy, age 3*

3.3.3. Reactions to the sedentary behaviour recommendations

Most participants considered the guidelines' suggestion that sedentary time should be minimised, was acceptable and sensible. One participant remarked that the aim of reducing sedentary behaviour, rather than setting a specific time limit, made it more achievable.

> *"Yes, I suppose that's good isn't it because that's immediately achievable by everybody because to reduce it means it doesn't matter whether it's a reduction of five minutes or three hours if you're reducing it you're actively thinking about trying to get them to put the games console down or do something different." P14, High SES, Girl, age 4*

However, other participants felt that having a specific time recommendation for screen-viewing would be useful.

> *"well I guess it's [sedentary behaviour recommendation] a bit vague really, I mean what might be watching too much tele for one person might be normal for the next, like how do you know what's too much and how much you need to reduce it by. Maybe it's just me but I think*

it needs to be more specific to be helpful really." P32, Low SES, Girl, age 3

Most participants felt that minimising screen-viewing was sensible and feasible and some acknowledged adverse effects of screen-viewing for their child. These included, that screen-viewing is addictive, it distracts them from playing and it makes their child unresponsive. Although the majority of participants felt that minimising screen-viewing was appropriate they also felt that their child currently had acceptable levels of screen-viewing and no reduction was necessary. Participants that expressed concerns over the effect of screen-viewing on their child talked about actively monitoring its use using strategies, such as breaking TV viewing up during the day and setting time limits. However, parents admitted it was easy to lose track of how much time their child spent screen-viewing.

"Sometimes I do feel like she's been on the tablet for too long as well erm because sometimes before you realise she's been sort of playing games and watching songs and things for like you know half an hour and then it's an hour and you didn't realise, because you've been busy doing stuff you realise she's just been sat there doing it." P12, High SES, Girl, age 3

Many participants also felt that screen-viewing in moderation was acceptable as long as it was balanced alongside physical activity and other activities. Screen-viewing was often seen to be a useful educational tool and a way for preschool children to rest.

"I think everything in moderation really. There are days if they're under the weather, or they're tired, they're quite happy to sit down all day and I don't think that's a bad thing, but I think, as long as they get some exercise most days." P15, Mid SES, Girl, age 3

"I would agree in terms of I think less telly would be a good thing… but if they're … or if, you know, if they're watching some of the programmes which are clearly like about developing language or letters or numbers, educational. I think you need to define sedentary activity better." P35, High SES, 2 Boys, ages 2 & 3

There was some concern that sedentary activities may be included in the guidelines that participants valued for their child, especially crafts and reading. Many participants felt that a balance of activities was appropriate and rest, crafts and intellectual activities were as important as physical activity.

"Yeah fair enough, they shouldn't be doing that [spending a long-time screen-viewing] but generally no, every child I think no matter what their age, even the parents like that, nice quiet time, having cuddles, reading a story together you know." P22, Low SES, Boy, age 3

"I don't know, I think if they're probably doing three hours [physical activity]… because there's benefits to that as well so … there's benefits to sitting down doing something … you know, they can … I don't know, be creative and use their imagination I think that's important as well." P21, High SES, 2 Girls, ages 2 & 3

The practicalities of reducing time spent in a pushchair or car seat were questioned by some participants. Participants felt that they were only used when really necessary and it was suggested that this was not an appropriate expectation of the guidelines.

> *"I think the pushchair or car seat thing erm isn't always an achievable thing to… not all pre-school children like to walk the way that you want to walk. And so actually it's not, you know it could be along a busy road you know or they could just want to be looking at everything else and you actually need to get from A to B so it's not always a possible thing to achieve things like that." P43, Mid SES, Girl, age 3*

3.3.4. Views of preschool children's screen viewing

Participants mentioned several screen-viewing devices that their preschool children had regular access to. These included a television, DVD player, laptop computer, PC, games console (e.g. Xbox or PlayStation), tablet, smartphone, and children's computer or tablet (e.g. VTech). All but one participant owned at least one television. The participant who did not own a television said that her preschool child would watch catch-up television from a laptop. All participants mentioned that their child had access to a smartphone. A few participants mentioned their child's use of a computer (PC or laptop).

> *"I have a preference for CBeebies (BBC Children's channel) so there's no adverts because I can't abide them." P36, High SES, Boy, age 4*

Generally, the television was watched by children independently or with a sibling, although some participants mentioned watching with their child or as a family and was seen as an opportunity for family time and closeness between family members. For example, participants described cuddling with their child whilst watching television or a film and described this as something that benefited both them and their child. This was not mentioned with other screen-viewing devices.

> *"Yeah there's certain programmes that we all sit down together and watch. Like Doctor Who. Saturday nights we all sit together as a family, have a cuddle, yeah, it's nice, we have our TV all mapped out that we're watching that night". P22, Low SES, Girl, age 3*

Access to mobile devices varied greatly. For instance, some participants felt a need to 'protect' their child from their smart phone, while one participant mentioned that her children had free reign to her smart phone.

> *"No I don't let them have access, we don't want them to be having access all the time (smartphone), I just don't like it." P35, High SES, 2 boys, ages 2 &3*

> *"Yeah they have access to my iPhone all the time, when they get hold of that and I can't find it anywhere…" P28, Mid SES Rural, Boy, age 4*

Some participants mentioned providing their child with their own mobile device (e.g. iPad or iPod touch) from a young age (i.e. 18 months to 2 years) to provide their child with a form of entertainment and education.

"We got him it [iPad touch] at eighteen months because someone had said have you tried this and I think that's what helped his, they're not games like erm what I remember like Super Mario which is just playing, they are quite secretly learning games, you can get all these things now that the child thinks they're playing a game but actually it's encouraging them to learn". P29, High SES, Boy, age 3

Participants gave a range of reasons why they allowed their child to screen-view. All the participants said that screen-viewing was a good way for their child to rest, relax or have some quiet time. This screen-viewing mostly consisted of television viewing, although some participants talked about giving their child a tablet or smartphone to play games or watch programmes on as a means of downtime. Screen-viewing was also encouraged by participants when they felt their child getting too wound up or excited, to calm the child down and prevent disruptive behaviour. Screen-viewing was viewed as a quick fix to the problem, especially as it requires no preparation or encouragement. Again, television was the predominant device used. As mobile devices provide portable access to television programmes, these were also used for this reason.

"She had an absolute meltdown about it and I just thought you need 20 minutes in her room. I put her in bed and I gave her my phone, and I let her watch Peppa Pig." P32, Mid SES, Girl, age 4

Participants described how they refused their child screen-viewing time (predominantly television) as a punishment for bad behaviour and provided screen-viewing time (predominantly mobile devices) as a reward for good behaviour.

"Yes it's also a good tool to bribe them with, like if you do this, that and the other, you can get to use the iPad." P13, Mid SES, Boy, age 4

Often the reason for the child's screen-viewing was to benefit the participant. For example, some participants encouraged their child to screen-view when they wanted to do some household tasks, so they could sleep longer in the morning, or if they needed to rest. Participants reported the screen-viewing was one of the few activities that didn't require the parent's involvement, and many referred to the child's unwillingness to play independently as a reason for screen-viewing. Other participants felt that their child would play independently for a short-period of time, but screen-viewing held their attention for longer periods of time. Television was most commonly used in this instance, although mobile devices were also often mentioned.

"I think with the TV, sometimes it's not just the need for them to physically stop but I kind of feel the need for them to mentally stop as well, if that makes sense… Um, and even if they are colouring they're, you know, um, I get exhausted by being with them sometimes." P36, High SES, Boy, age 4

The portable nature of mobile devices meant they could be used as a convenient and effective distraction for children in situations that required them to be patient and/or quiet outside of the home. For example, waiting for an appointment or when travelling in the car.

"Erm just kind of if we were travelling or something like that she normally uses it [smartphone] erm the other day we went to the

dentist and we took it with us because it's quite useful to kind of you know while she's waiting for us to have our teeth done kind of thing. They're portable it's so useful isn't it?" P10, Low SES, Girl, age 3

All participants felt that screen-viewing provided a valuable educational opportunity. Children's television programmes were thought to help children with language development, academic attainment and general knowledge. However, this appeared to be a consequential benefit of watching television and not the primary reason. Participants described using computers to help their child's learning (e.g. reading, letters, numbers, colours etc.) through games and videos. Games available on mobile devices were often seen as a fun, accessible and an easy way for mothers to help their children learn and were mentioned by most participants.

"She knows her alphabet pretty well and I'm absolutely sure that's from an app where she has to match up and it says the letter she matches up." P34, High SES, Girl, age 3

Some participants felt it was important that their child developed computer and/or touchscreen skills. This was mainly because they were aware that their child would be using these devices in school and wanted them to have a head start and not be behind their peers in terms of their computer skills. Some participants commented that computer use was an important component of modern life, and that children should be encouraged to understand and use it from an early age. One participant from the low SES area said that she did not feel that it was relevant for children to learn about technology until they were school age.

"I don't know how useful it is for a pre-schooler [using touchscreen devices], does that make sense? Whereas until he starts school and he starts however they learn they need to see it, try it, do it, get it right rather than sit down now." P45, Low SES, Boy, age 3

Many participants portrayed a sense of wonderment at their children's ability to use mobile devices (mostly participants from the high SES area). They found it rewarding to see their young child being competent at a skill. Some felt a sense of bemusement that their child used these devices so instinctively when they themselves did not feel so competent.

"Technologically I think they're amazing because they're actually so much better than we are, things on the computer and I'm like I haven't even taught you how to do that, she's like no, no but I know if I press this button." P14, High SES, Girl, age 4

Many participants were concerned about their perceived negative effects of screen-viewing; this was often regarding the content of the screen-viewing rather than length of screen time. For instance, some participants felt that some children's television programmes and computer games may be a negative influence and encourage bad behaviour or violence. Many participants talked about changes in their child's behaviour when they screen-viewed, including their child being slower, having less energy or 'zoning out'. This was predominantly relating to television viewing but also included mobile devices. Some participants talked about the addictive nature of screen-viewing and were concerned that their child would form habits that would continue into older childhood and the teenage years. Only a few participants mentioned concerns over the

sedentary nature of screen-viewing. The educational value (especially with interactive devices) and the need for the parent to keep the child occupied, appeared to outweigh any concerns participants had with screen-viewing. Some participants did not like their child screen-viewing but felt a sense of resignation that they needed to use it as a 'babysitting' tool.

> *"I think it's one of those that's probably easier, it's very, I don't like them to watch too much TV, I don't like the thought that they're just sat here watching something but I think practically sometimes it's just, well it is an easy option but I still, and I do do it at times but I don't like doing it and I wouldn't, I wouldn't want to do it." P13, Mid SES, Boy, age 4*

A child's preference for screen-viewing appeared to influence the amount of screen-time allowed. Many participants described the strong desire from their child to use mobile devices, and often parents felt they needed rules and restrictions in place to manage children's demands for their use. These included hiding devices, only being able to use devices in their fathers' presence and with his permission, installing a pass code on devices, and setting time limits on devices. However, it appeared that some of these children may still spend long periods of time using mobile devices. For instance, although one participant described restricting her child's use of the family tablet, she also allowed the child to use the device for up to two hours in one session. Some participants mentioned that their child would have tears and tantrums when a screen-viewing device was taken away, which participants described as difficult to manage.

Participant: "We've got them pass coded [iPad]. They can't pick it up without our permission."

Interviewer: "And how long would you let him use it for?"

Participant: "I guess not really much more than two hours." P55, Rural, Boy, age 4

"He does love it and he would ask for it and once he's playing it's difficult to encourage him not to. It would be difficult to get him off that onto another activity, difficult to upgrade from his favourite game." P31, High SES, Boy, age 4

Contrary to this, some participants felt that their child did not need restrictions on screen-viewing in order to prevent extended periods of viewing. For instance, some participants explained that their child did not have the attention span for extended periods of television viewing and could only watch 15 to 30 minutes of television before they moved onto something else. In addition, some participants who allowed their child to have free access to mobile devices found that after an initial enthusiasm for the device (e.g. a couple of months) their interest in it wore off and they would naturally choose other activities, such as playing with toys.

"In fact, he's not used the iPad for a few months now. He's not needed it, he's been quite happy playing by himself with his toys. I've not thought about it and he's not asked for it." P41, Mid SES Rural, Boy, age 3

Family members also influenced the preschool child's screen-viewing behaviours. Some preschool children were described as taking an interest in what their older sibling was doing on a computer, watching or participating with their sibling. Some participants said that their older child would teach their preschool child how to use the computer and play games with them. It also seemed that preschool children with older siblings were exposed to television programmes and computer games aimed at older children.

> *"The big thing which again he's probably quite young to be doing is Minecraft. Which is a horrible build game. So, he'll do that, but again that's his older brother influencing him." P55, Mid SES Rural, Boy, age 4*

Some participants described their child's father encouraging screen-viewing as a way of interacting in an activity with their child. A few participants described this with some contention, as this behaviour went against their desire to restrict screen-viewing. These participants said that their child's father had different views towards screen-viewing (especially mobile devices) than themselves, where they felt fathers believed that there was no need for restriction because screen-viewing was harmless, fun, and important for skill development.

> *"It's a bone of contention because he [child's father] can't see the problem with it [using touchscreen devices]... he's opinion is it's just fun and it's good and it does give you skills." P34, High SES, Girl, age 3*

Participants' own childhood experiences appeared to influence how they felt about screen-viewing. For example, one participant grew up with very little technology and wanted her child to enjoy an equally active lifestyle. Whereas another participant grew up with the television on all the time and felt that this was a positive experience because it stopped it being a novelty and she carried this through with her son.

> *"Oh we've always got the TV on, it's pretty much always on because when I grew up the TV was always on, and it's not a novelty at all… he won't really sit down and watch it, it's just always on." P39, Low SES, Boy, age 3*

3.3.5. Mothers views of the guidelines

Some participants reported that they felt the physical activity and sedentary behaviour guidelines for the early years were unnecessary. For example, two parents mentioned that if they had heard of the guidelines, they would not have taken notice of them because they felt their child was sufficiently active. In addition, another parent felt they were not relevant to her family.

> *"I'd like to think that we were on the healthier side of the middle start. I kind of look at the, not that, you know, I'm feeling smug and saying well it doesn't affect me but more that we're consciously doing it already. But I think the Government recommendations are really to try and pull those people who, you know, chuck the kids in front of the TV all day long… and you know sort of give them crisps and chocolate all day long." P36, High SES, 2 Girls, ages 3 and 4*

The guidelines were also viewed as being too broad, and some participants gave suggestions on how this may be improved. For instance: making the guidelines gender specific to accommodate the different playing styles of boys and girls (boys being described as engaging in boisterous play and girls engaging in creative and imaginative play); making them age specific to allow them to be more appropriate for the developmental stages of this age group (a 2 year old plays very differently to a 5 year old); and making them adaptable for children with different activity levels so that children with low-levels of activity may receive different recommendations than children with high-levels of activity.

> *"Erm, reduced from what, though because I think that's different for different personalities, because you've got some children, especially boys, you cannot get them to sit down and colour a picture because they're just not interested but girls will quite happily kneel down and play with a dolls house for hours.... I think I know it really is a blanket statement, but I think in general boys and girls are different like that because of the you know the fine motor skills for girls and then the large motor skills for boys." P39, Low SES, Boy, age 3*

> *"I'd say at a five-year-old level then yes, but under five, I mean is that literally from walking to five is it? Yeah I'd say it's a bit unachievable for kind of a two-year-old." P15, Mid SES, Girl, age 3*

Participants were concerned the guidelines could cause some stress and pressure for parents. Increasing physical activity was thought to require extra effort for the participant, which often did not feel feasible due to their own energy levels and time

constraints. This was felt to cause a feeling of failure or guilt for some participants who did not feel they had the capacity they felt was required to provide their child with additional activity opportunities.

> *"I don't think I'd be able to cope with three hours of activity every day to be honest you know. I'm a busy mum, I've got a lot to do. Housework and everything else you know. It's impossible for me to be able to just kind of put that amount of time aside to do something". P22, Low SES, Boy, age 3*

> *"Ideally all parents would like to do this, it's good to have the reminder but the reality isn't that easy. If a mum has had a bad day or the child is having a bad day then you'd take them out in the car or sit them in front of the TV just to get through it. It helps. It puts a lot of pressure on parents. If someone asked me to reduce sedentary time I would be mindful of it but I would be shocked that they asked." P57, Rural Mid-SES, Boy, age 4*

Some participants gave suggestions on how parents may help their child achieve the guidelines. When giving these suggestions they were talking about 'other mothers' and were not in relation to their own circumstances because they did not feel that their families needed change. These included lifestyle changes such as walking rather than using a pushchair or the car, providing more opportunities to play outdoors, enrolling the child in organised activities, being more involved and playing with the child, and encouraging creative activities as a replacement to screen-viewing.

3.4. Discussion

The data presented in this chapter suggests that mothers of preschool children are not aware of the recommendations within the UK physical activity and sedentary behaviour guidelines for the early years. Parents being unaware of guidelines is not a problem unique to the UK, as mothers from Canada have also been reported have a lack of knowledge of their sedentary behaviour guidelines[124]. Mothers interviewed in the Canadian study suggested that guideline information should be provided through health care professionals early on during motherhood or even during pregnancy to prevent habits forming[124]. Knowledge of the guidelines has been reported as an important first step to instigate behaviour change,[18] and so improved dissemination of the physical activity and sedentary behaviour guidelines for the early years may be important to raise awareness in parents of preschool children.

Alongside lack of knowledge that the guidelines existed, here it was also apparent that parents find physical activity and sedentary behaviour in preschool children hard to define. Similarly, an Australian qualitative study by Dwyer et al.,[125] found parents considered the concept of physical activity intensity difficult to apply to their preschool child's activity behaviours, and instead felt their child was either active or not active. Identifying physical activity in this age group is challenging. Firstly, the guideline factsheet for parents[120] informs that physical activity in the form of active play can be of any intensity (light to more energetic), but the guidelines[9] define active play as activities which involve movements of all the major muscle groups, and activities such as dressing-up and playing at a sand table are given as examples of as passive play. This

ambiguity and lack of clear distinction makes it difficult for parents to assess their own child's physical activity. Secondly, as acknowledged by the guidelines[9], physical activity in preschool children occurs in short spontaneous bouts throughout the day making calculating physical activity time problematic. In a recent accelerometry study, Ruiz et al.,[26] identified four patterns to describe physical activity in preschool children, that each contain varying brief periods of vigorous-, moderate-, and light-physical activity and sedentary activity throughout the day. Ruiz's study highlights that unlike adults and older children, preschool children incorporate physical activity in short bouts throughout most of their waking hours. Therefore, providing clearer, comprehensible explanations of what is considered as physical activity and sedentary behaviour according to the guidelines is necessary to help parents understand and assess these behaviours in their preschool child.

Mother felt that the physical activity and sedentary behaviour guidelines were appropriate for preschool children in general but not relevant to their family, mainly because they believed that their preschool child was already meeting the guideline physical activity and sedentary behaviour recommendations. They felt that their preschool child was very active, which was defined by the child's appearance of always being on the go, or busy. Parents defining their child's physical activity levels as a sense of busyness has also been reported in a qualitative study of parents with older children (age 5 to 6 years)[126]. Mothers reported that they only used pushchairs, car seats and highchairs when it was necessary and so screen-viewing may be the only potentially modifiable sedentary behaviour that was specified in the guidelines. However, mothers reported that they were satisfied with the amount of time their child spent screen-

viewing and they had no need or desire to make any changes. Qualitative studies have reported mothers' reasons for their preschool children's television viewing. These included as a way for children to rest [127-129], to use as an electronic babysitter [124 127-130] and as a behaviour management tool [128 129]. These reasons for television viewing were confirmed in this study but were also given for mobile devices use. In addition to these reasons, participants reported that computers and mobile devices are used as an educational tool to facilitate learning by using educational games. Apps on mobile devices for preschool children are often promoted as educational. It appears to be commonplace for schools and educational and parenting websites to recommend educational apps to use with preschool children, thereby promoting their use as an educational tool (e.g. [131 132]). The use of touch-screen devices as a tool for learning in preschool settings is reported to stimulate concentration and motivation for literacy activities, and provide opportunities for communication and interaction, independent learning and feelings of achievement in young children [133]. Within the home, a study of 106 3-5 year olds reported that the use of educational apps have been associated with higher letter sound and name writing skills but time on tablets was not associated with emergent literacy skills [134]. More research is needed on the potential role of touch-screen devices on learning in the early years. It is likely that the quality of the experience with touch-screen devices is more important for effective learning than duration using them [134].

Although mothers in this study felt that their preschool child had acceptable levels of screen-viewing, some mothers used screen devices (especially smartphones) with caution and felt their allure to children difficult to manage. They also showed concerns

about their accessibility, the child's behaviour that mothers feel result from use of mobile devices, and the possibility that screen-viewing might have a negative effect on their child. However, many of these mothers felt that mobile devices were now a necessary and unavoidable part of life and allowed their child to use them regularly with some reluctance. Similarly, Carson *et al*. [124] reported that Canadian mothers of preschool children had some reservations about using screen-viewing as a babysitter but could not think of any viable alternatives. In contrast, some mothers in this study did not show concerns over screen-viewing for their child and support its use, this included television viewing, computer use and mobile device use. For television viewing it seems that this is because there is no perceived harm in watching it, whereas mobile devices and computer use is encouraged for educational purposes. A qualitative study in six European countries concluded that parents do not have concerns over their child's television viewing or computer use, however their views on mobile devices were not reported [127]. Nevertheless, most (but not all) mothers in this study felt the need for rules and restrictions to manage their child's screen-viewing, which have been cited to influence the type of sedentary activity a child participates in at home,[130]. This is consistent with findings from a quantitative study in Canada that reported 81% of parents of 3-year olds had household rules for screen time [135].

Mothers beliefs that their preschool child is already meeting the physical activity and sedentary behaviour guidelines, and that they are not relevant for their family indicates they may not be receptive to the guidelines when they are made aware of them. For instance, there was a tendency for mothers to talk about 'other families' when discussing the guidelines as they felt that their own family had no need for change and

therefore the guidelines were aimed at 'other families'. The inclination to deflect discussion of screen-viewing to other parents has also been noted by another qualitative study[128]. Therefore, physical activity and sedentary behaviour recommendations need to be translated into accessible public messages that are easy to communicate and help parents identify with a need for behaviour change. Furthermore, an improved understanding of how to engage mothers with the guidelines is needed.

Mothers were concerned that the physical activity and sedentary behaviour guidelines could cause feelings of stress and guilt in parents. For instance, they felt an increase in physical activity may be problematic for them or their child, as they felt they were doing as much as they were able. This study and others indicate some parents have concerns that increased physical activity and reduced sedentary behaviour mean the displacement of activities mothers' value such as reading and crafts,[124 129 136]. It has previously been reported that parents' use screen-viewing as a coping strategy, in order for them to either do household chores or rest themselves,[124 129 136], and this was also reported by mothers in this study. Parents with high levels of stress are less likely to limit the amount of TV their children watch, than parents with normal levels of stress (OR = 0.32, 95% CI, 0.11-0.93)[137] highlighting the use of screen-viewing as a coping strategy for mothers. A qualitative study by Evans et al., reported that parents felt reducing television viewing in their 6 to 7 year old children would cause conflict in the home and require resources (e.g. financial and time) that they were unsure they could provide,[138]. If a reduction in preschool children's screen-viewing is recommended to parents, then it is important to understand how to best support parents to successfully reduce this behaviour and provide practical strategies and alternatives.

Including specific strategies to support change to meet the guidelines would be welcomed by parents,[124]. Messages that are framed based on the potential gain to both the child and the parent (rather than negative or loss-framed messages) and that enhance self-efficacy have been cited as being most effective in physical activity promotion,[139].

3.4.1. Strengths and limitations

The results provide a useful insight into mothers' views of the physical activity and sedentary behaviour guidelines for the early years, which has not previously been reported. The findings could be used to inform the development and dissemination of physical activity and sedentary behaviour promotion initiatives for the early years, and the design of interventions aimed at improving these behaviours. A strength of this study is that a diverse sample of mothers were recruited in terms of varying SES areas, which included both urban and rural areas, working and non-working mothers, and single-parents. In addition, the interviews held were semi-structured in nature, allowing participants to raise issues that were salient to them but not considered prior to interview by the researcher.

A limitation of this study is that most mothers were White-British, so findings may not be generalizable to the views of mothers from other ethnic groups. Also, mothers may have been inclined to give socially desirable responses and there was a possibility of selection bias as it may be that mothers with an interest in physical activity were more willing to take part in the study.

3.4.2. Conclusions and future research

From the data, four key issues that may prevent positive physical activity and sedentary behaviour change in preschool children were identified:

1. Mothers were not aware there are physical activity and sedentary behaviour guidelines for this age group;

2. Mothers believed that their preschool child was sufficiently active and easily met or exceeded the guideline recommendation and did not feel that the guidelines were relevant to their child.

3. Mothers reported they had difficulties in defining and quantifying physical activity in their preschool child, suggesting they may not be able to make an accurate assessment;

4. When presented with the UK physical activity and sedentary behaviour guidelines for the early years, mothers felt they did not provide enough information about how the recommendations can be achieved for them to be constructive.

In order to address these issues, improved promotion of the guidelines is required to raise mothers' awareness and further research is needed into the most effectual dissemination methods to achieve this. It is necessary to help mothers relate the guidelines to their preschool child by using clearer terminology and more practical and relevant examples. Clear key messages need to be developed that reframe the guidelines into pragmatic and usable targets that are accessible for parents

CHAPTER 4. HELPING PARENTS DEFINE AND QUANTIFY PHYSICAL ACTIVITY IN PRESCHOOL CHILDREN

4.1. Introduction

Study 1 investigated mothers' perceptions of their preschool child's physical activity and sedentary behaviours and explored their views of the UK physical activity and sedentary behaviour guidelines for the early years. As discussed in Chapter 3 (section 3.4.2), four key issues were identified that may prevent positive physical activity and sedentary behaviour change in preschool children:

1. Mothers were not aware there are physical activity and sedentary behaviour guidelines for this age group;

2. Mothers believed that their preschool child was sufficiently active and easily met or exceeded the guideline recommendation and did not feel that the guidelines were relevant to their child.

3. Mothers reported they had difficulties in defining and quantifying physical activity in their preschool child, suggesting they may not be able to make an accurate assessment;

4. When presented with the UK physical activity and sedentary behaviour guidelines for the early years, mothers felt they did not provide enough information about how the recommendations can be achieved for them to be constructive.

This study (Study 2) explores these issues further through focus groups with parents of preschool children. The results of this study are presented in two chapters (Chapter 4 and 5). This present chapter explores how to define and communicate physical activity and sedentary behaviour recommendations that is helpful for parents. Chapter 5 focuses on the dissemination of the physical activity and sedentary behaviour guidelines.

To help parents define and quantify their preschool child's physical activity, it might be helpful to provide a more descriptive and clear definition of what physical activity in preschool children is, and the types of activity that contribute to the three hours per day physical activity recommendation. In addition, as the current three-hour per day physical activity recommendation includes activities of any intensity, a breakdown of intensity levels and what they signify would also be advantageous in helping parents understand what counts as physical activity. The aim of this study was to ascertain what words or phrases can be used to describe different levels of physical activity intensities in preschool children that parents find helpful and informative and generate a list of specific play activities to provide examples for each of these intensities.

4.1.1. Study overview design

In order to address the aims, this study comprised of two phases:

Term generation: A preliminary review was carried out, to generate a list of terms to describe different physical activity intensities that could be used as a starting point for discussion in the focus group that followed.

Focus groups with parents: The main study involved focus group with parents of preschool children that utilised a nominal group technique methodology in addition to a group discussion

Further details of these two phases are presented below. The methods and results for the term generation are presented first, followed by the methods and results of the focus groups.

4.1.2. Methods: Term generation

A review to produce terms and descriptions for different levels of physical activity intensity was carried out to provide a starting point for discussion in the focus groups with parents. First, a list of words and phrases was compiled by analysing the interview data from Study 1 (Chapter 3). Words and phrases that participants used to describe different intensities of activities were identified. Then a review of Government physical activity guidelines documents (from UK [9] , Australia [140], and Canada [141]) , NHS [142], and British Heart Foundation National Centre for Physical Activity and Health (BHFNC) [143] physical activity information and promotional material was carried out to identify the terminology used to describe physical activity intensities. The rationale of using these sources was to combine formal and lay terminology. The terminology and text phrases from these sources that had been used to describe or explain physical activity intensity in preschool children were compiled into a table (presented in the results).

After compiling and reviewing this list, the researcher selected terms that described and encapsulated each physical activity intensity category (sedentary, light-intensity, and

moderate to vigorous-intensity). This selection process entailed the researcher carefully considering each individual term in turn, starting with the interview data and comparing this with the guideline documents to see if the same or similar terms were used. Terms were chosen based on how well they reflected the guideline definition of that intensity category. Given the objective of this study, to provide understandable guideline information for parents, terms used by parents were favoured over those from the guidelines (e.g. the lay term 'being still' was selected over the formal term 'physical inactivity' for sedentary behaviour).

Potential terms were discussed with PhD supervisors and then within a departmental seminar with colleagues (researchers within the field of physical activity) to consider their suitability and were refined where necessary. Descriptions to sit alongside these terms were then written, based on existing guideline definitions for physical activity intensity but also considering terminology occurring in the interview data. For example, for light-intensity physical activity, the term and description produced were: "Pottering: involves slow easy movements and standing play."

4.1.3. Results: Term generation

The full list of terms and descriptions generated from the review of terms and descriptions are presented in Table 4.1.

Table 4.1 List of physical activity intensity definitions and activity examples for preschool children

		UK guidelines[9]	CA guidelines[87]	AUS guidelines[140]	NHS[142]	BHFNC [143]	Interviews
Sedentary	Descriptions	Behaviour that occurs while seated or lying down and which require very low levels of energy expenditure.	Behaviours that involve very little physical movement while children are awake, such as sitting or reclining	Time spent being physically inactive.	Being inactive		Down time Chilling Rest Quiet time Close / family time Being still
	Activity examples	Watching TV Naps Fidgeting Drawing Reading Travelling by car, bus or train Being strapped into a buggy	Sitting in a stroller, high chair or car seat Watching television Playing with non-active electronic devices such as video games, tablets, computers or phones	Sitting in strollers, highchairs, car seats. TV viewing	Watching TV Travelling by car, bus or train Strapped into a buggy		Screen viewing Reading Cuddles Zoning out

		UK guidelines	CA guidelines	AUS guidelines	NHS	BHFNC	Interviews
Low intensity	**Descriptions**	Slow movement of the trunk from one place to another	No definition	No definition	Light activity	Light activity	Pottering
	Activity examples	Pottering Moving about Standing up Walking at a slow pace		Standing up Moving around Walking at a slow pace Less energetic play	Standing up Moving around Walking Less energetic play	Moving about, standing up Walking at a slow pace	Being busy Playing with toys on the floor
Moderate intensity	**Descriptions**		5-6 on scale of 10. You can talk but not sing your favourite song. Working hard enough to raise heart rate.	Similar intensity to a brisk walk	*	*	On the go Being active Dashing about
	Activity examples			Playing in the park Any active play Riding a bike	*	*	

		UK guidelines	CA guidelines	AUS guidelines	NHS	BHFNC	Interviews
Vigorous intensity	Descriptions	*Rapid movement of the trunk from one place to another	Energetic play (preschool) For adults and children: 7-8 on scale of 10 You will not be able to say more than a few words without pausing for breath.	Huff and puff Any sort of active play will usually include bursts of vigorous activity	*Energetic activity Huff and puff Active play	*Energetic activity Huff and puff	Being non-stop Getting exhausted Going crazy
	Activity examples	*Climbing Swinging/hanging playing games in a park with friends Riding a bike Dancing to music Running Swimming Skipping	Hopping Jumping Skipping Bike riding	Running Skipping Organised activities: Dance Gymnastics	*Active play Hide and seek Stuck in the mud Running around Jumping on a trampoline Riding a bike Dancing Swimming Climbing Skipping rope Gymnastics	*Running Chasing games Dancing to music	Running full pelt Running about

*Moderate and vigorous intensity were grouped together (described as energetic activity or moderate to vigorous activity)

From this list, the following descriptions were produced as described. These were then taken forward as a starting point of discussion in the subsequent focus groups.

Sedentary:

'Still' activities are carried out sitting or lying with little or no movement.

The term 'Still' was taken from Study 1 interview data, where a parent had described their child's sedentary time as "being still". Guideline documents most commonly described this intensity as sedentary or inactive.

Light-intensity physical activity:

'Pottering' involves slow easy movements or standing play.

The current UK guideline information uses the term 'Pottering' as an example of light intensity activity. Pottering was also used as a term by parents in Study 1 interviews.

Moderate to vigorous intensity physical activity:

'Huff and puff' play is energetic play that makes children feel warm and breathe harder.

The UK guideline information currently describes moderate to vigorous intensity physical activity as rapid movement of the trunk from one place to another. The term 'Huff and Puff' was used by Australian guidelines, NHS and BHFNC physical activity guideline information. There were no appropriate lay terms for this intensity.

4.2. Methods

Focus groups were held with parents, main carers or guardians (from here on collectively called parents) of preschool children to assess their views of the terms and descriptions for physical activity intensities identified through the preliminary study. The groups were also used to explored what specific play activities illustrate the physical activity intensity descriptions using the nominal group technique. This study was approved by the Faculty of Health Sciences Research Ethics Committee at the University of Bristol (ref: 28402).

4.2.1. Recruitment

The selection criteria for this study required that participants were the parent of a preschool child (2 years to until they commenced formal schooling or reached the age of 5) and spoke English. Unlike Study 1, the study was open to both fathers and mothers. Participants were recruited through social media, nurseries and preschools, and by word of mouth.

Social media

The researcher joined the Facebook (www.facebook.com) community and parenting groups for different postcode areas in Bristol. An advertisement was posted on each group page (Appendix 6). The advertisement was posted on six different group pages, with membership numbers ranging from 475 to 9,124. These groups were selected on the basis of the IMD status of that postcode area based on Bristol City Council data (however there were variations of IMD status within each area) with the intention of recruiting parents from areas that varied in terms of levels of deprivation. Interested parents were asked to contact the researcher directly either via email or personal

message on Facebook. Following initial contact, potential participants were provided with a study information sheet that outlined the requirements of the study (Appendix 8). At this stage, participants were offered the opportunity to telephone or email the researcher if they had any questions. If interested, consent forms (Appendix 7), a demographic questionnaire (Appendix 9), and a copy of the information sheet was sent to addresses provided by interested parents/guardians, along with a pre-paid postage envelope.

Nurseries and preschools

The researcher contacted the managers of nurseries and preschools that were located in areas of varying SES, based on the IMD scores for their postcodes. They were asked if they would be able to send an email or flyer out to parents with children in their preschool. Eight nurseries and preschools were contacted. Three emailed parents and two handed out flyers to parents (Appendix 6). The emails and flyers both gave a brief description of the study and asked parents to contact the researcher directly if they wanted more information.

Snowball sampling

Information about the study spread via word of mouth between parents that had agreed to take part in the study and their friends and resulted in additional parents contacting the researcher for more information.

Postcodes of potential participants were used to calculate individual IMD scores using an online IMD postcode search tool[144]. The information given was then used to try and ensure an economically diverse sample of parents participated (low to high IMD) in the

focus groups. Numbers of participants recruited through each venue is presented in the results (Figure 4.3)

4.2.2. Data collection times and settings

Initially, participants were able to choose from an evening, weekend or daytime group to suit their availability. Allowing parents to select their preferred focus group time and recruiting parents from various IMD areas at the same time led to the first three groups being from mixed IMD areas. After the first three groups had been conducted, parents were purposefully sampled to ensure the next three groups would include individuals from one SES tertile per group (either low, mid or high SES). To do this, the venue, date and time were prearranged and then a Facebook group and nurseries in a specific postcode area representative of either a low, mid or high SES were targeted to take part in that group.

A free crèche facility was provided for children under 5-year-olds for the three weekday morning groups. The crèche was run by qualified childcare workers and was held in a specialised children's playroom within the community centre. To facilitate recruitment and thank participants for the time, a £20 Love2Shop voucher was given to everyone who took part following their participation.

4.2.3. The focus group protocol

Each focus group consisted of three steps that included a nominal group technique (NGT). Each of these steps and its aim are summarised in Table 4.2. and are described

fully below. A topic guide was developed to ensure these steps were covered and to ensure consistency across the groups in terms of what areas were discussed (Appendix 10). All focus groups were audio recorded and field notes were taken throughout.

Table 4.2. Study 2 focus group protocol

Step no.	Focus group task	Details	Aim / purpose
	Warm up and ideas generation	Participants discuss their child's preference for play activities in pairs and feedback to the group. Play activities mentioned by parents are written on individual post-it notes by the researcher.	Helps participants to become comfortable talking and expressing their views within the group and creates a warm and supportive atmosphere.
Step 1	Exploring physical activity intensities	Proposed physical activity intensity descriptions are displayed on flipcharts and discussed. As a group, play activities generated in Task 1 are sorted under these physical activity intensity descriptions.	Participants provide feedback and opinion on the intensity descriptions presented. The accuracy of these descriptions can be gauged by how easily participants sort play activities.
Step 2	Nominal Group Technique (NGT): Ideas generation	Individually, participants are asked to list play activities that their child could do at home in the following situations: • Play activities that hold your preschool child's attention the longest • Play activities that require little or no encouragement from the parent • Play activities that require little or no preparation • Play activities that require little or no parental involvement • Play activities are fed back to researcher who writes them onto individual post-it notes.	Idea generation to allow for maximum variation with examples of play activities that fall under each in intensity description. Further examination of the intensity descriptions by categorising each activity as a group. Clarification of responses to ensure the group agree on meaning. Consolidation of duplicate or similar activities to facilitate voting process in Task 4.

		As a group, the activities are sorted under the physical activity intensity descriptions. Activities are further sorted to remove duplicates and groups similar activities.	
Step 2	NGT: Voting	Parents are given coloured-coded stickers and are asked to put stickers on their top three play activities for each of the following: • Play activities that hold your preschool child's attention the longest • Play activities that require little or no encouragement from the parent • Play activities that require little or no preparation • Play activities that require little or no parental involvement	To identify the top favoured play activities for each scenario for the group.
Step 3	Discussion	Participants discuss the results. Facilitator leads discussion about participants' preferences for the presentation and dissemination of physical activity and sedentary behaviour guidelines.	Explore participants' reactions to the results and discuss what might make these favoured play activities difficult to carry out (e.g. having a baby in the house, lack of space). Explore participants' views about how they would like to receive guideline information.

Step 1: Exploring physical activity intensities

The first step of the focus group explored parents' assessment of the three physical activity terms and descriptions developed in the preliminary stage of the study (Still, Pottering and Huff and Puff). Parents were questioned about their opinions of each term, in turn e.g. "What play activities do you think the term 'Huff and Puff' relates to?", "What do you think of the term 'Huff and Puff'?". Attention was paid to parents' understanding of the phrases and whether they felt that they captured the nature of that intensity of physical activity as intended by the researcher e.g. if parents felt that the term "Huff and Puff" represented moderate to vigorous intensity activity. If parents felt there were problems with the term or they felt it did not correctly represent the intended physical activity intensity, this was explored further within the group and these issues and any alternative terms parents felt were more fitting discussed. If this issue had not been resolved (i.e. parents could not agree on a term to represent a physical activity intensity), the researcher clarified with the group what each of the descriptions represented and moved on to the next step.

Step 2: Ideas generation and selection

The purpose of step 2 was to generate a list of play activities that fitted within each of the three physical activity intensity descriptions and to illustrate what counted as physical activity for preschool children. For example, 'obstacle courses' was given by a parent as a play activity and placed under 'Huff and Puff' by the group. In addition, this step aimed to create a list of play at home activity ideas for four different scenarios that may be barriers to play at home that were identified in Study 1. Generating play activity

ideas for each of these scenarios would also provide practical examples that could complement guideline information targeting parents.

These scenarios were:

1. Play activities that hold your preschool child's attention the longest
2. Play activities that require little or no encouragement from the parent
3. Play activities that require little or no parental preparation
4. Play activities that require little or no parental involvement

4.2.4. Selection of analytical method

A decision-making methodology was viewed as most suitable for this stage because of its ability to generate a large quantity of ideas and provide group consensus. Three decision-making methodologies were considered for this task: The Nominal Group Technique (NGT), Delphi Technique, and a Brainstorming group. NGT was selected for several reasons. It is time efficient, it is possible to collect a large amount of data within one session, and it is useful for studies working with a limited budget, which is the usually case with doctoral degrees. Additionally, the process allows for results from different groups to be amalgamated during the session, thus instantly producing a final set of ideas. This was particularly important for comparing and consolidating responses from different SES groups to evaluate potential differences. The ability to utilise group dynamics whilst limiting the possibility of a dominant participant influencing the group was also very appealing, especially as parenting tends to be a personal and emotive subject.

Nominal Group Technique

NGT is a multi-step group procedure that involves sorting and ranking ideas. It can be used to elicit and prioritise ideas from a group of people in response to a question or problem. The term nominal is used in to describe the process of people working independently in the presence of others [145]. It was originally developed by Delbecq and Van de Ven in early 1970's [146] and derived from their social-psychological studies of decision conferences and program planning [145]. Since then, the NGT has become an established method for generating ideas, problem solving and reaching a consensus within a group by many different disciplines, such as health and social research, education and course evaluation, industry and government organisations [147]. An NGT group usually has up to 10 participants. Multiple groups can be held and the results of each of these groups combined [145]. The NGT has a set structure [145 147 148] that involves five steps (Table 4.3).

Table 4.3 The Nominal Group Technique process

Introduction and background	Participants are provided with a background to the session, the rules and the session's structure and are presented with a question or problem
1. Individual idea generation	Participants individually note down their ideas or responses to the question or problem posed
2. Round robin feedback	Participants feedback their responses one at a time until all responses have been presented. The facilitator writes all responses verbatim onto a flipchart.
3. Clarification and consolidation	The facilitator ensures that the meaning of each response is clear to the whole group. Any repetitions are consolidated, and similar responses are grouped together.
4. Ranking of responses	Individually participants rank their top responses (usually between 3 to 10 responses) in order of importance using a score sheet.
5. Calculating final ranked responses	The facilitator calculates the final top 5 ranked responses and feeds them back to the group for discussion.

Use of the Nominal Group Technique within the focus group

Within the first focus group held, traditional NGT methods as described in Table 4.3 were used with one modification. The modification was that rather than posing a question and ranking the responses based on that question, participants were asked to produce examples of play activities for the four different scenarios and individually rank their top five responses for each of these scenarios. Participants carried out the NGT process four times within one session (rather than once or twice as in a traditional NGT session). During the first focus group, it became evident that this method was not practical. Participants appeared burdened by the number of scoresheets they needed to

complete for the ranking exercise and the amount of data that was collected made it difficult for the facilitator to calculate the top ranked responses in the time available.

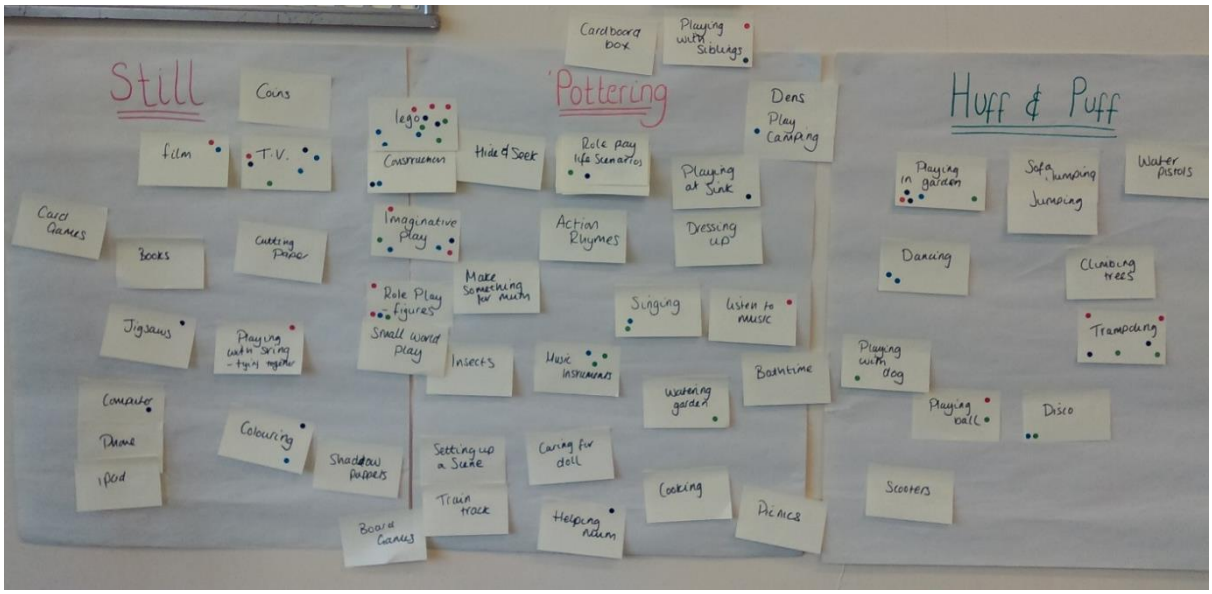
Reflections from the field notes taken during the first group suggested that the initial approach was ineffective. Therefore, specific processes were modified for subsequent groups. This modification process is consistent with previous studies, which have adapted the NGT methodology to make the process more appropriate for their research question or for their sample group [149-153]. For example, a study investigating end of life care, found that extra sensitivity needed to be applied so that issues participants raised that were important to them personally, were not rejected in the ranking process. To address this issue, they asked participants to individually give all the issues listed a score between 0-10, rather than ranking their most important issues. The summed scores for each issue were then calculated after the session [149].

The following methodology was used for the remaining five focus groups. Rather than completing scoresheets to rank their top five activities for each of the four scenarios, participants were asked to place a coloured sticker directly by the idea displayed on the flipchart, for their top three activities for each given scenario. Three activities, rather than five, were chosen to reduce time and simplify the task. Each colour represented a scenario. This methodology is commonly used in website and product design industries. For example, User Experience consultants frequently use this technique to facilitate client workshops during their design process[154]. A User Experience digital designer was

consulted to explain this process[155]. To help illustrate this process, Figure 4.1 contains a photograph of a flipchart after voting had been carried out for group 4.

The modified NGT methodology took considerably less time than the traditional method (around 30 to 45 minutes rather than 1 hour 15 minutes) and enabled all scenarios to be included during each session. Moreover, it reduced the burden on participants and it provided an instant visual display of the results, thus enabling subsequent discussions. Unlike the traditional NGT methods, the modified NGT methodology did not rank the results, and participants only rated three rather than five play activity ideas. However, when evaluating the results of the first group with subsequent groups, they appeared to produce comparable results (the results from all six groups were included in the analysis). A limitation of the modified method was that the voting process was not anonymous. Therefore, participants could see the choices others made, which could have influenced their own. To reduce the influence between participants, the group facilitator advised participants before starting the session that they were to think about their own preschool child's personality. Parents were reminded that all children are different, so it was likely the choices the participants make would be different from each other. To assess the extent that any influence between participants may have occurred, audio-recordings and field notes taken during each group of the groups were examined during analysis, to see if conversations took place, or comments made, about participant's choices. In addition, noted that nearly all groups carried out this exercise in silence and any conversations that did take place were not relevant to the task. Photographs were taken of the flipcharts for all groups once the voting had been completed.

Figure 4.1. Group 4, final flipcharts following the modified NGT process



4.2.5. Focus group analysis

Qualitative analysis

Audio recordings were transcribed verbatim by an external transcription company and field notes were typed up by the researcher. Thematic analysis was used for this study because it allows for a flexible approach that enables a deductive and inductive approach to the data [121] . For this study, this was an important approach to the analysis to analyse both existing concepts (e.g. whether the physical activity intensity descriptions were understood by parents) and identify themes that derived from the content of the data (e.g. how parents related the physical activity intensity descriptions to their preschool child).

The first step of this analysis involved familiarisation of the data by repeated reading of the transcripts by the researcher and one supervisor (KMT). During this process, meanings, patterns and ideas that later informed the content of a coding frame were

identified. Coding data is a process of organising data into meaningful groups [121]. Coding at this stage aimed to identify and organise parents' thoughts regarding each of the three physical activity intensity descriptions and any other themes that emerged from the data. The researcher and supervisor used this initial coding frame and applied it to the transcripts. Discrepancies between the coding were discussed and the coding frame was refined. To improve trustworthiness of the analysis [156], using this coding frame the researcher and supervisor independently coded a further three transcripts. Interpretations of the data were discussed to ensure consistency in how sections of text were coded.

All transcripts and field notes were imported into data analysis software package, NVivo (V.10.0, QSR, Southport, UK) to enable electronic coding and retrieval of data. This was to ensure that discussions about the descriptions that occurred elsewhere in the group and group dynamics could be included in the analysis Thematic analysis is an iterative and reflexive process [121] so when a new theme was identified, a new code was developed and added to the existing coding frame (Appendix 11).

Once all the data had been fully coded using the final coding frame, analysis turned to the development of themes relating to parents' reactions to the physical activity intensity descriptions. Theme development was an active process of identifying patterns and links from the coded data. This involved identifying groups of codes that related to the same concept, identifying clustering of codes and looking for concepts that groups of codes related to. These initial themes were discussed and refined with both

supervisors. The result of this was identification of four overarching themes and nine subthemes. For this study, some overarching themes derived from the need to answer a specific research question (i.e. what are parents' opinions of the three physical activity intensity descriptions?), whereas others were driven from the data. Quotes presented in the results have been tagged with the group and participant identification number and if they were a mother or father (e.g. Group 1 Participant 4 would be tagged G1P4, Mother).

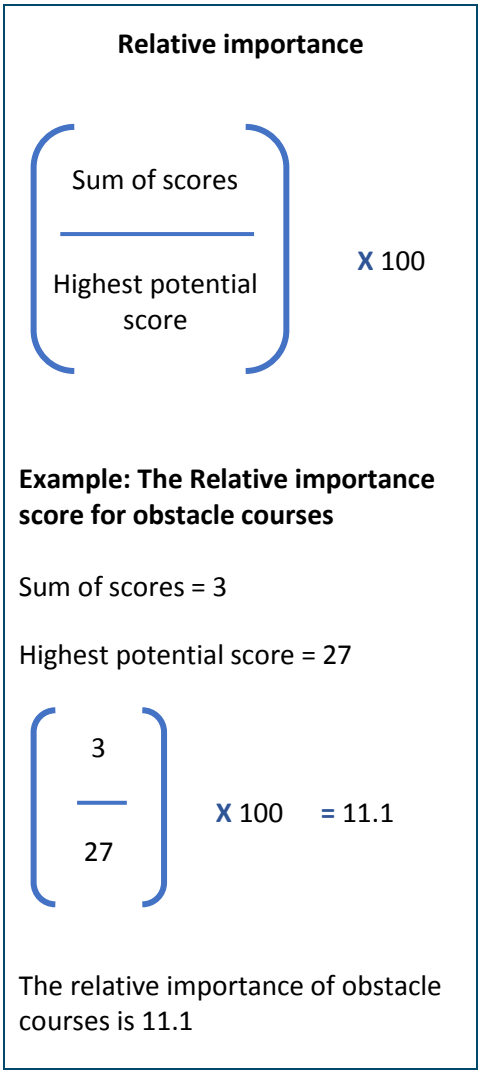
Analysis of the modified NGT

Using the photographs taken of the flipchart results, the categorisation of play activities under each intensity term was listed in a table. Percentages of activities placed within each intensity category were calculated and then compared between groups. Using these results, a final list of play activities and their physical activity intensity description was produced in a table.

Participants were asked to place a sticker on their top three most relevant play activities for each scenario. The sum of scores (the number of stickers on each activity) for each scenario from all six groups was calculated and presented in a separate table (i.e. the number of times an idea was voted for by participants). For example, 'Role Play' received a score of 13 across the six groups for Scenario 1: Play activities that hold your preschool child's attention the longest. Each table also includes:

- The number of groups that endorsed each play activity (the number of groups that had at least one participant place a sticker on that activity).
- The groups that endorsed each play activity (which groups 1 to 6 had at least one participant place a sticker on that activity).
- The highest potential scores each play activity could receive (This equates to the total number of participants in the groups that had suggested that play activity within the ideas generation stage. For example, four groups had suggested 'obstacle courses' as a play activity and there were 27 participants in those four groups. So 'obstacle courses' could potentially have received a highest potential score of 27).
- The relative importance provides an indication of the ranking for each activity after taking account of the highest potential ranking for that activity, which differed across focus group. [(sum of scores) ÷ (highest potential score) X 100] (Figure 4.2) [152].

Figure 4.2. Example of how to calculate relative importance score for the nominal group technique results



4.2.6. Reflexivity Statement

During this current study I had one two-year-old son and during the last three focus groups I was in the early stages of pregnancy with my second son. I had gained insight into some of the issues raised by parents in the first study (e.g. using a pushchair out of necessity and the difficulties in keeping a young child entertained whilst attending to household tasks). My transition to parenthood, and new understanding of the challenges of being a mother of a young child, had heightened my research interests of parents' perspectives of preschool children's physical activity and sedentary behaviours. Following from the results of the first study (Chapter 3), the research could have been taken in various different directions, however, I chose to carry out an in-depth investigation into how the physical activity and sedentary behaviour guidelines could be improved for parents and provide a voice for parents that hadn't previously been considered in research in this area

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4.3. Results

4.3.1. Participants

In total, 109 parents (105 mothers and 4 fathers) initially got in touch with the researcher expressing an interest in taking part in the study. After receiving more information, 18 parents wanted to take part but could not make the focus group times, nine parents replied that they felt that the study was not for them, and the final 42 did not get back in touch. The breakdown of how participants were recruited, drops outs and final participants is given in Figure 4.3.

Six focus groups were conducted with 40 participants (between 5 to 9 participants in each group). Of the six focus groups held, two groups were held in the evening, one on a Saturday morning and three on a weekday morning. The two evening groups and Saturday morning group were held within a University of Bristol meeting room. The three weekday morning groups were held within a community centre that was chosen due to its child care facilities and its convenience for the target communities.

Participant demographics are presented in Table 2.1. Participants were mostly mothers, with only one father taking part. Participants were from varying IMD postcode areas and groups were generally of mixed IMD. However, group 4 was predominantly high-IMD (quintiles 1 and 2), group 5 was mid-IMD (quintiles 2,3,4), and group 6 was low-IMD (quintiles 4 and 5). Parents from the low-IMD group were younger than the high-IMD group (31 years vs 40 years). The mean age of parents was 37 years, their preschool child had a mean age of 3.7, and they had an average 2.2 children per household. Most parents were White-British and were either working part-time or not in paid employment.

Figure 4.3 Methods of recruitment

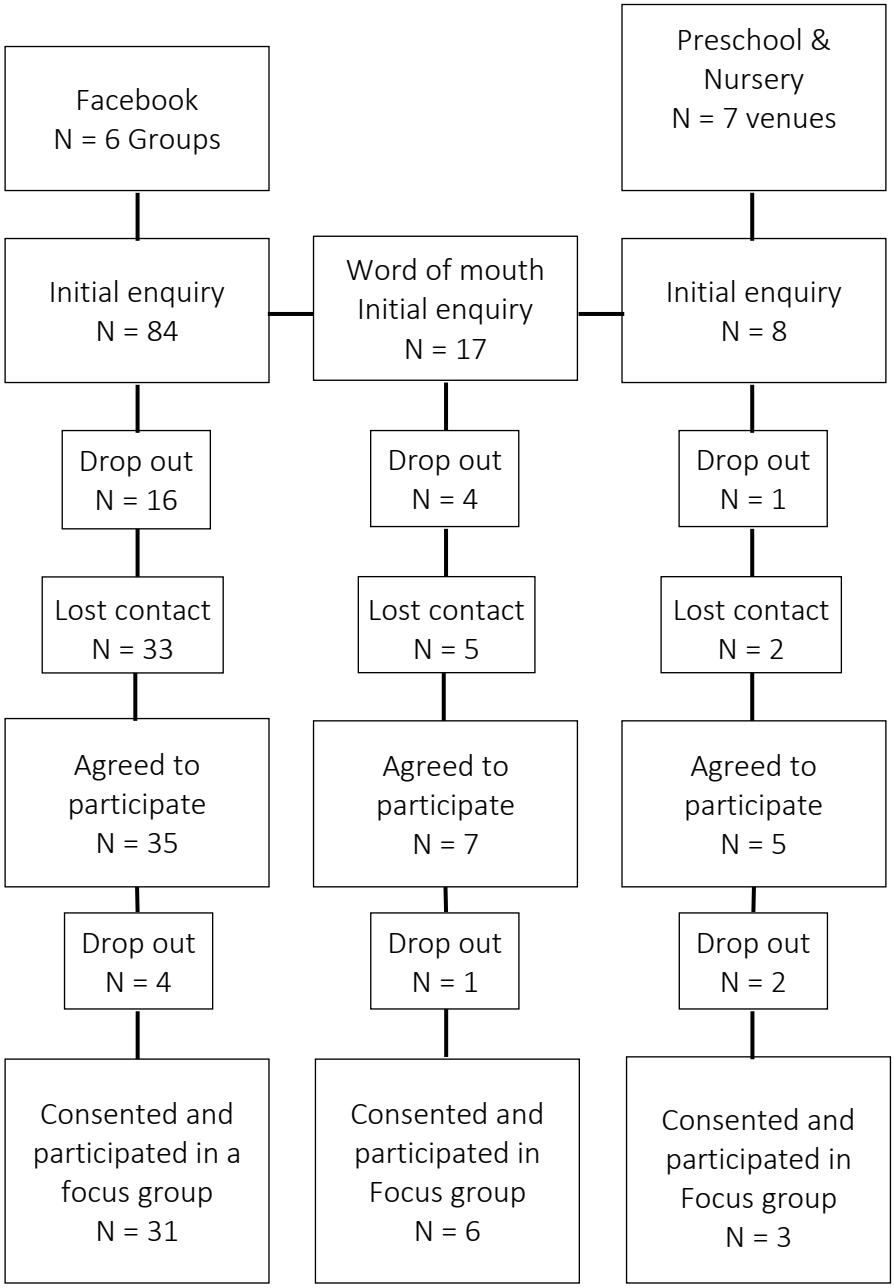


Table 4.4. Table 4.4 Descriptive statistics for participants by focus group

		All Groups		Group 1		Group 2		Group 3		Group 4		Group 5		Group 6	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Participants		40	100	9	100	7	100	5	100	6	100	6	100	7	100
Mothers		39	97.5	9	100	6	85.7	5	100	6	100	6	100	7	100
Fathers		1	2.5	0	0	1	14.3	0	0	0	0	0	0	0	0
Preschool Girl		17	42.5	4	44.4	2	28.6	4	80	2	33.3	1	16.7	4	57.1
Preschool Boy		23	57.5	5	55.6	5	71.4	1	20	4	66.7	5	83.3	3	42.9
Employment	Part-time work	20	50.0	7	77.8	4	57.1	2	40	3	50	2	33.3	2	28.6
	Full-time work	2	5.0	0	0	1	14.3	0	0	0	0	0	0	1	14.3
	Full-time carer	14	35.0	1	11.1	2	28.6	2	40	3	50	2	33.3	4	57.1
	Maternity leave	4	10	1	11.1	0	0	1	20	0	0	2	33.3	0	0
IMD Quintile	1	9	22.5	3	33.3	1	14.3	0	0	5	83.3	0	0	0	0
	2	10	25.0	3	33.3	2	28.6	2	40	1	16.7	2	33.3	0	0
	3	7	17.5	0	0	1	14.3	3	60	0	0	3	50	0	0
	4	7	17.5	2	22.2	1	14.3	0	0	0	0	1	16.7	3	42.9
	5	7	17.5	1	11.1	2	28.6	0	0	0	0	0	0	4	57.1

Ethnicity	White - British	36	90	8	88.9	7	100	4	80	5	83.3	5	83.3	7	100
	White - Other	3	7.5	0	0	0	0	1	20	1	16.7	1	16.7	0	0
	Asian British - Pakistani	1	2.5	1	11.1	0	0	0	0	0	0	0	0	0	0
		M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Parent Age		37	7	40	4	37	6	36	6	40	5	38	3	31	5
Age of preschool child		3.7	0.6	3.7	0.5	3.6	0.6	4.1	0.3	3.7	0.5	3.9	0.9	3.3	0.7
Number of children in household		2.2	0.8	2	0.9	3.1	0.7	1.6	0.5	2.5	0.8	2	0.9	3	0.5

4.3.2. Assessment of the physical activity intensity descriptions

The first stage of this study was to explore parents' views on the physical activity intensity terms and descriptions.

Still

Participants initially suggested that Still play activities may include reading, jigsaws, crafts, playing with toys on the floor and screen-viewing. It was suggested that Still described actively playing with a limited range of movement or playing without movement whilst being engaged. Participants felt a child's engagement was an important part of Still play, as it was necessary to capture that they were actively involved in play rather than just being idle.

> *"Like the little one will be playing with her dolls and using her imagination and I would say that is still even though she's actively doing something." G4.P43, Mother, IMD 1, Boy, aged 4*

> *"Still isn't necessarily they've not gone on stand-by kind of thing… So he's still, he's not using gross motor skills or anything like that but his brain is probably doing overtime because it's not like … he's not switched off, he is still... he's engaged." G6.P59, Mother, IMD 4, Boy, aged 4*

However, all groups, apart from Group 3, had a discussion as to whether a preschool child is ever still. Some parents felt that Still play only described time in which their child was resting, at bedtime, or watching TV. This was because they felt that their child was never or rarely still. For some parents, even watching TV was not considered

a still activity because their child was often moving, climbing or playing whilst watching.

> *"The only sort of time I ever would consider to be actually still is probably that pre-bedtime, snuggled up, either with the telly or the book or, because every other activity seems to be much more pottering there, you know, puzzles aren't still, puzzles are getting up and down and …" G1.P14, Mother, IMD 5, boy, age 3*

> *P28 "Although I've found at three… They [children] don't sit and craft, they get up from the table, go and get a thing, bring it up, put it down.*
> *P37 "Yes like [Child's name] will sit on the back of the sofa to watch telly but then he'll be swinging [laughter] on the handles to the window at the same time." G2.P28, Mother, IMD 5, girl, age 3. & G2.P37, Mother, IMD 3. Boy, age 3*

Other parents felt that their child could be still when concentrating on an activity such as reading or colouring. Most felt that the ability to be still or concentrate varied, dependant on the age of the child and the personality of the child.

> *"She's always been able to focus, from the very first day she was born, she's very good at sort of being quiet and having that sort of 100% focussing on something and she can do that for increasingly long periods of time now. Whereas my second would be much more like your daughter, like running around and doing a bit and then losing interest and having like these very short attention spans, we can't watch films all the way through without jumping around and, you know, so maybe it's personality as well as the activity itself." G2.P25, Mother, IMD 1, girl, age 4*

Leading on from discussions of the relevance of the term Still, most groups discussed terms that they thought could be alternatives. Calm was suggested by three groups. However, it was felt that children could be still but not calm, and calm was more a reflection of the behaviour parents desired from their children rather than what occurred.

> *"No because my children can be still and very not calm…Calm is more what you would like it to be. [laughs]" G4.P42, Mother, IMD 1, boy, age 3*

Downtime was also suggested as a potential alternative. Some parents felt that it was a commonly used word amongst parents and explained periods in the day when the child may be resting rather than playing. However, parents agreed this word did not consider activities such as reading or crafts where their child may be mentally engaged. Again, this word was also thought to reflect parents' desire rather than what actually took place.

> *"Yeah like you say it doesn't engage their brain, for me downtime is just looking in front of the TV or you know actually sometimes, I mean reading a book might be downtime as well but that like that might be him looking through the book himself because he can't read but he might just sit there and look through the book." G5.P50, Mother, IMD 3, boy, age 4*

Other alternatives that were mentioned by individuals were ‘actively sitting’, ‘non-active’ and ‘quiet time’ but were dismissed by others in the group.

Throughout the discussions, there was much debate as to the nature of children’s ability to be still and whether it is possible to categorise play into a sedentary activity. Three of the groups concluded that, although there is a variation between children’s ability to be still (where for some children it may be seconds and others minutes), that activity (e.g. reading or colouring) is being carried out the child is still. Therefore, Still was an appropriate term when used to refer to the activity rather than the child’s movement.

> *“I think ‘Still’ works because there are, if you’re drawing, by the very nature of drawing, even if it’s just 30 seconds or two minutes or five minutes, you have to be physically on the spot because that’s where everything is, and even if they do get up and bounce around the room, maybe the way they approach a still activity is different, but for some children, yeah, for that time, even though that child is still.” G1. P27, Mother, IMD 1, girl, age 4*

> *“Or sometimes we have to combine one and another for the personalities, that we were saying like my son will have an attention span of two minutes and then he’s into something else, but he might come back and do another scribble and then go back, but it’s still, I still think the activity per say is a still activity, although he needs the huffing and puffing after the two minutes or something like that to go with it.” G2. P32, Father, IMD 2, boy, age 3*

In addition, some parents felt the term Still was more appropriate than sedentary. They felt that sedentary had negative connotations as it made children sound lazy or not engaged. Still time was seen to be important for both the child and parent to have some 'downtime' or rest (especially after preschool or to unwind before bed). It was also viewed as an important time to develop fine motor skills, and creative and academic development. Because of this, parents felt that it was important that sedentary time was not presented negatively.

> *P40: "I think that does conjure up children better than sedentary because they're generally not sedentary at all even when they're still.*
> *P42: Because they're not choosing to be lazy, they're just kids doing less or more*
> *P40: And also they need their downtime don't they?"*
> *G4.P40 Mother, IMD 1, girl, age 4, & G4. P42, Mother, IMD 1, boy, age 3*

Pottering

The term Pottering led parents to think of play which involved children moving around the house, standing, playing on the floor but moving around (e.g. playing with cars), or being busy or productive. Play activity examples they initially thought of included large floor puzzles, water play, sand play, cars and trains, dolls, pretend cooking and tea parties.

> *"For my daughter the sort of toys that she's into at this age, she does potter with them, like you say the play kitchen, like you know, pretending to make tea and she'll have her Barbie's out, dollies, feeding her dollies and so it is very much pottering around the toys kind of thing." G3. P31, Mother, IMD 3, girl, age 3*

Parents agreed that Pottering made up most children's play activities. Still and Huff Puff activities usually revert back to Pottering.

> *"I think, maybe it is down to interpretation and that's it, for me that's exactly how, that's a good word. I'd describe his, probably about 50% or more is pottering; it's starting with this and then he'll move on to that…" G6. P58, Mother, IMD 5, boy, age 2*

All groups agreed that Pottering was an acceptable and appropriate term for this level of intensity play. They felt that it provided a visual description of how children play with toys. Parents appeared to appreciate that Pottering was a positive term, and a term that most people could identify with.

> *"Pottering is the right word to describe their play, especially when playing with toys". G3. P11, Mother, IMD 2, girl, age 4*

> *"I think pottering's a really positive word as well… and it's more practical for the two kids as well" G6. P58, Mother, IMD 5, boy, age 2*

However, for one parent with English as a second language in Group 5, Pottering was too colloquial. She was unsure what it meant and said there was no direct translation in her language. This group then discussed the importance of having a further description to each intensity term to clarify its meaning.

Huff and Puff

Parents in most groups provided more examples of Huff and Puff play activities than either Still or Pottering. These included dancing, running, scooting, trampolining, playing with balloons, jumping on the sofa, rough and tumble, completing obstacle courses and being outdoors.

Parents recognised the importance of this level intensity play for the health and development of their child. Many parents felt that Huff and Puff play was an opportunity to "burn off energy" and helped manage their child's behaviour.

> *"We've got a big trampoline as well, so even in the midst of winter when it was cold, wrap them in suits, 'go and bounce for half an hour please' just to calm him down because he's very … bouncing off the furniture, he's very physical." G2. P19, Mother, IMD 2, boy, age 4*

However, Huff and Puff was also associated with several difficulties for parents and often talked about negatively. For instance, some parents talked about their child becoming disruptive through Huff and Puff play, which may be difficult to control. They found that once a child was in this state it was difficult to for them to calm down again. Some parents with younger children or babies talked about how they tried to minimise Huff and Puff play within the home, because of concerns of the younger child becoming hurt.

> *P10: "I think when you're on your own with a child, if you get them to that level of excitement, it makes the rest of your time together quite difficult because you then have to deal with the emotional fall outs after that high energy. – cause emotionally dealing with that level of*

energy for child, afterwards there's a come down from it and they – they do react differently. I think their personalities affect that part of it, how they deal with it afterwards. Some really struggle to get back to that calmer attitude.
P39: That's why it's easier to do that outside of the home [laughs]. Transition from right we're going inside now."
G3, P10 Mother, IMD 3, girl, age 4, & P39, Mother, IMD 3, girl, age 4

Some parents felt that their child easily reached Huff and Puff intensity every day, whereas other participants struggled, especially within the home. This was partly associated with the personality of the child but also with environmental limitations, such as the need to leave the house to have the space to do Huff and Puff activities or no access to a garden.

P31: "I think I struggle with – to get them to that level within the house.
P10: Yes. I mean we do go up and down stairs a lot and I do think going up and down stairs is good exercise at that age and – but generally the only time I feel I can get her to that stage is say if we're walking somewhere and we try and sort of – I run away from her and she runs to me or she runs – so it's a bit artificial.
P39: We go out, that's how we get to that level, to the park or you know, to the zoo or the wild place or somewhere like that, that she's off leash so to speak and she can run safely."
G3, P31, Mother, IMD 3, girl, age 3; P10, Mother, IMD 3, girl, age 4; & P39, Mother, IMD 3, girl, age 4

"We have to physically go out of the house together to the park but to run around our garden is just not suitable for it." G6. P57, Mother, IMD 4, girl, age 2

Huff and Puff play often requires supervision, which parents found problematic in some situations.

"You have to make time for it; you can't be inside doing one thing whilst they're outside doing another." G4. P45, Mother, IMD 1, boy, age 3

Parents provided examples of how they often control Huff and Puff play. For instance, for many children it occurred prior to bedtime when they seem to naturally engage in more physical play. Parents reported attempting to calm children in this instance and encouraging more sedentary activities as an alternative. Parents also talked about encouraging children to engage in Huff and Puff play by taking them outside to release energy and help control behaviour.

P15: "My children rev up at half past six. Like literally we're 'argghhh' around the house and it's just like 'oh, slow down'.

P28: Yeah, and they literally run round and they are puffed or dizzy and then they fall down and then, hahaha, get up and go again. Stop!

P32: Getting rid of energy in whatever way they can."

G2. P15 Mother, IMD 5, boy, age 2; P28 Mother, IMD 5, girl, age 3; & P32 Father, IMD 2, boy, age 3.

Huff and Puff was felt to be a self-explanatory term. Parents felt that it summed up and helped visualise energetic play, so were happy for it to be used as a label for vigorous intensity activity.

4.3.3. Categorising play into an intensity

During groups 1 and 2, parents said there needed to be an additional intensity level to bridge Pottering, and Huff and Puff. The researcher discussed this with subsequent groups. It was felt that combining moderate and vigorous intensities was not helpful because children can be using gross motor skills and be active without becoming out of breath. Playing on a climbing frame, dressing-up, action rhymes, and running around the house were all given as examples of this moderate intensity play. This type of play was felt to be too active to be Pottering but not active enough to be Huff and Puff.

> *P23: "I think you're missing a stage though. What I'm thinking, huff and puff is jumping around and going crazy, pottering is just …*
> *P18: It's the word slow, isn't it? Because there's something in between where you're playing with your cars …" G1. P23 Mother, IMD 4, girl, age 3 & P18 Mother, IMD 1, girl, age 4*

> *P58: "There's sort of more hyper stage just after that pottering stage. Do you know what I mean – got work their way up to do that.*
> *P57: You know like maybe it's like climbing on a climbing frame isn't it … pottering but you're not necessarily sweating and –*
> *P55: Maybe on the go kind of stage.*
> *P58: Got up and then, they're about in the garden, but they're not at that kind of like sweaty hairline stage yet."*
> *G6. P58 Mother, IMD 5, boy, age 2; P57 Mother, IMD 4, girl, age 2; & P55 Mother, IMD 5, girl, age 4*

Some groups discussed terms that could be used for this moderate intensity play, which would sit between Pottering and Huff & Puff. These included moderate play, boisterous play, bouncy, active play, physical play, and on the go. All terms were dismissed after discussion apart from 'On the Go', which parents felt captured moderate intensity activity accurately to sit between Pottering and Huff and Puff.

The nature of preschool children's play was discussed by most groups. Parents talked about how children play at a variety of intensities within a short space of time, thus making a play difficult to categorise into one intensity. For instance, an activity that may be described as Still such as doing a jigsaw puzzle, may involve crawling on the floor to reach pieces, or even running around the jigsaw. It appeared that same play activity may be played at different levels of intensity dependant on child's personality. For example, one parent described how a child may role play a princess that involves sitting and playing, whereas another child may choose to role play a superhero that would involve running and jumping.

> *"In terms of what they do with the dressing up, because my son's best friend loves dressing up as Elsa the princess, but then she'll sit down and play with the dolls, as for my son he dresses up as Batman or Superman or Spiderman and has to be running around and jumping off the sofa." G1, P38 Mother, IMD 4, boy, aged 3*

In addition to this, an activity may change intensity depending who else was joining in. One mother suggested that if the child was playing hide and seek with the father it may

be considered a Huff and Puff activity, whereas if she was playing with her child it would be a Pottering activity.

> *"This is a really difficult one [hide and seek] isn't it 'cause it depends who you are. [Laughs]. If it was Daddy it would probably turn into huff and puff, but with me it would be pottering." G3. P35 Mother, IMD 2, boy, age 3*

These issues of categorising a play activity under an intensity, meant some groups discussed the need to think about play on a spectrum or continuum, rather than under specific headings. Parents felt this was a more helpful and accurate way of thinking about the intensity of children's play. In addition, some parents felt that the term Still was more relevant and meaningful when thought of as being at the end of a spectrum rather than in isolation.

> *P42 "Seeing Still time on its own didn't – yeah, that maybe made me think that wasn't the right word, but I think you can't really see it in an isolated…*
> *P40: Yeah, sort of on a spectrum of…*
> *P42: So for three minutes they're really fast and then they slow down and they'll be sitting colouring and then suddenly they'll think I've got to get, like a little toy and they'll run to like…" G4. P42 Mother, IMD 1, boy, age 4 & P40 Mother, IMD 1, girl, age 4*

4.3.4. Categorising play activities under the physical activity intensity terms

Participants generated a list of play activities based on group discussion and individual idea generation. These ideas were displayed, and participants were asked to decide which intensity term each activity should be placed under, Still, Pottering or Huff and Puff. Photographs of the flipcharts with the final categorisation for all activity ideas are provided in (Appendix 12). As each group generated different lists of activities (although most activities were mentioned in more than one group), each group had a different set of activities to categorise. Table 4.5 lists all the activities mentioned by the groups and how many groups placed the activity under each intensity description. As described previously, often participants felt that activities sat between two intensities (e.g. Still and Pottering) because they were dependent on how the child was carrying out this activity. Because of this, participants could choose to place an activity between to intensities descriptions. There was a consistency of how activities were categorised between groups, with most activities falling under either just one or two intensity descriptions (e.g. Still or Pottering or in between the two). The only variance to this was for playing with a sibling and helping a parent with household chores, which crossed over the three intensity descriptions. Qualitative analysis suggested that both these types of play are dependent on the play preference of the child and influences from other people, i.e. playing with a baby sibling versus playing with an older sibling.

Table 4.5 Play activities generated by the six focus groups and their physical activity intensity as categorised by each group

	Play activity	N of groups included activity	Still	Still & Pottering	Pottering	Pottering & H&P	Huff & Puff	All
				Number of groups				
1	Audio books	1	1					
2	Ball games	6				1	5	
3	Balloons	1					1	
4	Bath	4		1	3			
5	Big Box	1			1			
6	Board games	4	2	1	1			
7	Bug hunt	1			1			
8	Cars and trains	2			2			
9	Construction	6	2	2	2			
10	Cooking	6			6			
11	Crafts	4	2		2			
12	Cycling	3					3	
13	Dancing	5					4	
14	Dens	5				4	1	
15	Dolls	1			1			
16	Drawing	6	5		1			
17	Dressing up	6			4	2		
18	Experiments	1			1			
19	Gardening	5			3	1	1	
20	Hair and make up	1			1			
21	Helping around the house	5			2	2	1	1
22	Hide and seek	5			1	2	2	
23	Jumping in the home	4					4	
24	Junk modelling	2	1		1			
25	Listening to music	1			1			

26	Magazines	1	1					
27	Making music	2			2			
28	Messy play	3			3			
29	Mud pies	2			2			
30	Obstacle courses	4					4	
31	Organising toys	2	1		1			
32	Painting	2	1		1			
33	Paddling pool	1					1	
34	Tea party	2			2			
35	Playing with dog / cat	2					2	
36	Playing with friends	2			1	1		
37	Playing with parent	3			1		1	
38	Play with siblings	5			2	2		1
39	Playing in the garden	4				1	3	
40	Playdoh	3	2		1			
41	Push along or ride on toys	1					1	
42	Table continued.							
43	Role play	6		3	1	2		
44	Rough and tumble	2					2	
45	Running games	4					4	
46	Sand play	5			5			
47	Scooting	5				1	3	
48	Shows/performance	1				1		

With all groups combined, twenty percent of the activities were placed under Still, 5% under Still & Pottering, 36% under Pottering, 13% under Pottering & Huff and Puff, 26% under Huff and Puff, and 1% covered all intensities dependent on how they were played. These proportions were similar for all groups. However, Group 1 felt that their

children were particularly active and placed no activities under Still and 56% of their activities under Huff and Puff. This group had more working parents compared to other groups. They were also older than the average age of participants in the other groups. There was an almost equal number of preschool boys and girls discussed in the group (5 boys vs 4 girls). Whereas, Group 3 commented that their children were not particularly active and placed 42% of their activities under Still, 27% under Pottering and 12% under Huff and Puff. Participants in this group were equally split between part-time work and full-time parenting responsibilities. However, this group were predominantly parents of preschool girls (4 girls and 1 boy).

In keeping with the traditional NGT method, participants were encouraged to combine similar play activities into one group. For instance, role-playing different scenarios (e.g. doctors or schools) were grouped together under 'Role play – scenarios). Similar play activities were also combined by the researcher after all focus groups had taken place to avoid unnecessary repetition of comparable activities (Table 4.6). Activities were combined if they required similar cognitive skills and physical movement from the child. For example, performing crafts and junk modelling both use creative skills that are carried out sitting or standing at a table, and so were combined under 'crafts'. These combinations were cross-checked with supervisors to ensure agreement.

Table 4.6 Revised activities grouped by participants and the researcher

Revised activity groups	Activities included	Revised by
Balloons & bubbles	Balloons Bubbles	Group
Board games and puzzles	Board games Puzzles	Group and researcher
Crafts	Crafts Junk modelling Playdoh	Researcher
Drawing and painting	Drawing and colouring Painting	Group and researcher
Playing on furniture	Jumping on cushions / sofa Playing on the stairs Climbing furniture	Researcher
Playing with another child	Playing with a friend Playing with a sibling	Researcher
Playing in the garden	Garden toys Bug hunts Mud pies	Group and researcher
Reading	Books Magazines Story telling	Group and researcher
Role play	Doctors / schools etc. Tea parties	Group
Sand play and water play	Sand play Water play	Researcher
Scooting and cycling	Scooting Cycling / playing on bikes	Group and researcher
Small world	Small world Imaginary play with figures or soft toys Cars / trains Dolls and dolls houses	Group and researcher

The final intensity description for each activity was calculated based on group vote and the following rules (Table 4.7):

Table 4.7 Rules applied to calculate final intensity descriptions for each activity

	Situation	Rule
1.	Equal number of votes between two individual intensities (e.g. Still and Pottering)	Combined intensity chosen (e.g. Still & Pottering)
2.	Equal number between individual and combined intensity (e.g. Still and Still – Pottering)	Combined intensity chosen (e.g. Still & Pottering)
3.	Equal number between intensities and All intensities is also selected by a group (e.g. Pottering, Huff and Puff and All)	All intensities are chosen
4.	All has received a vote, but an individual intensity has majority vote	Majority vote is chosen
5.	Majority vote chosen in all other cases	

A final list of play activities and the physical activity intensity description they have been categorised under is presented in Table 4.8.

Table 4.8 Physical activity intensities of play activities categorised by participants

Physical activity intensity description	Activity
Still	Audio books Board games and puzzles Reading (looking at books, magazines and telling stories) Shadow puppets Stickers Tablet / phone TV Writing
Still and Pottering	Construction (e.g. Lego, Duplo, building blocks) Crafts and junk modelling Drawing, colouring and painting Organising toys
Pottering	Bath Big Box play Cooking and baking Experiments (with parent) Gardening Hair and make-up (with parent) Helping around the house Listening to music Making music Messy play Dressing up Role play (e.g. doctors, schools, tea party) Sand play and water play Singing and action rhymes Small world (imaginary play with figures, including cars and dolls)
Pottering and Huff and Puff	Dens Hide and seek Playing in the garden (including bug hunts, mud pies, and garden toys) Push along or ride on toys Shows/performance Treasure hunts

Huff and Puff	Ball games Balloons and bubbles Dancing Obstacle courses Playing on furniture Playing with a dog Rough and tumble Running games Scooting and cycling Trampolining
All	Playing with a parent Playing with another child (sibling or friend)

4.3.5. Modified Nominal Group Technique

Participants voted for their top three most relevant play activities for four scenarios: 1. Play activities that hold your preschool child's attention the longest: 2. Play activities that require little encouragement from the parent: 3. Play activities that require little or no preparation: 4. Play activities that require little or no parental involvement. The following four tables present the results for each of these scenarios. Only play activities that received at least one vote are presented. Play activities are ranked by the sum of scores.

Table 4.10. Play activities that require little or no encouragement from the parent

		No. groups endorsed	Which groups endorsed	Highest potential score	Sum of scores	Relative importance %
1	Small world	5	1,2,3,5,6	40	12	30.0
2	Dressing up	4	1,2,3,6	40	10	25.0
3	Construction	5	1,2,3,4,5	40	9	22.5
4	Hide and seek	4	1,2,3,5	33	7	21.2
5	Messy play	3	2,3,6	19	4	21.1
6	Trampolining	3	2,4,5	26	5	19.2
7	Playing with a parent	2	1,2	22	4	18.2
8	Role play	4	1,3,4,6	40	7	17.5
9	TV	2	4,6	24	4	16.7
10	Experiments	1	5	6	1	16.7
11	Rough and tumble	1	5	6	1	16.7
12	Playing in the garden	4	2,3,4,5	31	5	16.1
13	Reading & story telling	3	2,3,5	40	6	15.0
14	Sand play and water play	5	1,2,3,4,5	40	6	15.0
15	Hair & make up	1	6	7	1	14.3
16	Drawing & painting	3	1,4,6	31	4	12.9
17	Tablet / phone	2	4,6	24	3	12.5
18	Dancing	3	1,2,5	33	4	12.1
19	Balloons	1	1	9	1	11.1
20	Helping around the house	2	4,6	29	3	10.3
21	Playing on furniture	2	1,2	29	3	10.3
22	Board games & puzzles	4	1,3,4,5	40	4	10.0
23	Stickers	1	5	11	1	9.1
24	Playing with another child	2	4,6	31	2	6.5
25	Ball games	2	1,6	33	2	6.1
26	Cooking and baking	2	1,5	34	2	5.9
27	Dens	1	1	35	2	5.7
28	Scooting and cycling	1	2	35	2	5.7
29	Crafts and junk modelling	2	2,3	40	2	5.0
30	Singing and action rhymes	1	6	33	1	3.0

Table 4.9 Scenario 1: Play activities that hold your preschool child's attention the longest

		No. groups endorsed	Which groups endorsed	Highest potential score	Sum of scores	Relative importance %
1	Role play	6	1,2,3,4,5,6	40	13	32.5
2	Dressing up	6	1,2,3,4,5,6	40	11	27.5
3	Small world	5	1,2,3,5,6	40	11	27.5
4	Playing with a parent	3	1,2,4,	22	5	22.7
5	Balloons	1	1	9	2	22.2
6	Construction	5	1,2,4,5,6	40	8	20.0
7	Sand play and water play	4	1,2,3,6	40	8	20.0
8	Playing in the garden	4	2,3,4,5	31	6	19.4
9	Playing with another child	4	2,3,4,6	31	6	19.4
10	Tablet / phone	1	6	24	4	16.7
11	TV	3	4,5,6	24	4	16.7
12	Push-along or ride-on toys	1	5	6	1	16.7
13	Playing on furniture	2	1,2	29	4	13.8
14	Drawing & painting	3	2,5,6	31	4	12.9
15	Board games & puzzles	4	1,2,5,6	40	5	12.5
16	Trampolining	2	4,6	26	3	11.5
17	Obstacle courses	2	1,5	27	3	11.1
18	Messy play	2	2,6	19	2	10.5
19	Ball games	3	1,5,6	33	3	9.1
20	Hide and seek	3	1,3,5	33	3	9.1
21	Dens	2	1,6	35	3	8.6
22	Listening to music	1	4	13	1	7.7
23	Playing with dog	1	1	13	1	7.7
24	Helping around the house	2	1,2	29	2	6.9
25	Cooking and baking	2	1,6	34	2	5.9
26	Reading & story telling	2	2,3	40	2	5.0
27	Dancing	1	1	33	1	3.0
28	Singing and action rhymes	1	1	33	1	3.0
29	Crafts and junk modelling	1	5	40	1	2.5

The top three play activities that parents felt held their children's attention the longest were all forms of imaginative play - role play, dressing up and small world (acting out life scenes in miniature, e.g. playing with small cars and a garage). These activities were all categorised by parents as 'pottering' intensity. Only five of the 29 activities endorsed were categorised as 'Huff and Puff'. Playing on a tablet or mobile phone had the highest relative importance (57.1%). Although only one group had it as an activity to vote for, over half that group voted for it as their top three activities that holds their children's attention the longest.

Table 4.10. Play activities that require little or no encouragement from the parent

		No. groups endorsed	Which groups endorsed	Highest potential score	Sum of scores	Relative importance %
1	Small world	5	1,2,3,5,6	40	12	30.0
2	Dressing up	4	1,2,3,6	40	10	25.0
3	Construction	5	1,2,3,4,5	40	9	22.5
4	Hide and seek	4	1,2,3,5	33	7	21.2
5	Messy play	3	2,3,6	19	4	21.1
6	Trampolining	3	2,4,5	26	5	19.2
7	Playing with a parent	2	1,2	22	4	18.2
8	Role play	4	1,3,4,6	40	7	17.5
9	TV	2	4,6	24	4	16.7
10	Experiments	1	5	6	1	16.7
11	Rough and tumble	1	5	6	1	16.7
12	Playing in the garden	4	2,3,4,5	31	5	16.1
13	Reading & story telling	3	2,3,5	40	6	15.0
14	Sand play and water play	5	1,2,3,4,5	40	6	15.0
15	Hair & make up	1	6	7	1	14.3
16	Drawing & painting	3	1,4,6	31	4	12.9
17	Tablet / phone	2	4,6	24	3	12.5
18	Dancing	3	1,2,5	33	4	12.1
19	Balloons	1	1	9	1	11.1
20	Helping around the house	2	4,6	29	3	10.3
21	Playing on furniture	2	1,2	29	3	10.3
22	Board games & puzzles	4	1,3,4,5	40	4	10.0
23	Stickers	1	5	11	1	9.1
24	Playing with another child	2	4,6	31	2	6.5
25	Ball games	2	1,6	33	2	6.1
26	Cooking and baking	2	1,5	34	2	5.9
27	Dens	1	1	35	2	5.7
28	Scooting and cycling	1	2	35	2	5.7
29	Crafts and junk modelling	2	2,3	40	2	5.0
30	Singing and action rhymes	1	6	33	1	3.0

Three ‘Pottering’ activities received the highest scores for activities that require little or no encouragement from the parent – small world, dressing up and construction. Small world play and dressing up also had the highest relative importance (35.7% and 33.5% respectively).

Table 4.11 Scenario 3: Play activities that require little or no preparation

		No. groups endorsed	Which groups endorsed	Highest potential score	Sum of scores	Relative importance %
1	Making music	1	4	6	2	33.3
2	Helping around the house	5	1,2,4,5,6	29	9	31.0
3	Role play	5	1,2,3,4,6	40	10	25.0
4	Small world	6	1,2,3,4,5,6	40	10	25.0
5	Playing in the garden	5	2,3,4,5,6	31	7	22.6
6	Dressing up	5	1,2,3,5,6	40	9	22.5
7	Rough and tumble	1	3	5	1	20.0
8	Dancing	5	1,2,3,4,5	33	6	18.2
9	Singing and action rhymes	5	1,2,3,4,6	33	6	18.2
10	Writing	2	3,5	11	2	18.2
11	Drawing & painting	4	1,2,3,5	31	5	16.1
12	Playing with the dog	1	4	13	2	15.4
13	Ball games	3	1,2,4	33	5	15.2
14	Hide and seek	3	1,2,3	33	5	15.2
15	Hair & make up	1	6	7	1	14.3
16	Playing with another child	3	2,5,6	31	4	12.9
17	Construction	2	1,4	40	5	12.5
18	Reading & story telling	3	1,2,3	40	5	12.5
19	TV	2	4,5	24	3	12.5
20	Trampolining	3	3,4,6	26	3	11.5
21	Stickers	1	5	11	1	9.1
22	Scooting and cycling	3	1,2,5	35	3	8.6
23	Tablet / phone	1	6	24	2	8.3
24	Playing on furniture	1	1	29	2	6.9
25	Bath	1	6	19	1	5.3

26	Board games & puzzles	2	2,5	40	2	5.0
27	Sand play and water play	1	2	40	2	5.0
28	Running games	1	3	25	1	4.0
29	Gardening	1	4	31	1	3.2

Role play, small world and dressing up were the top three activities that require little or no preparation. All six groups had one or more participants that voted for small world play. Construction, making music and playing with the dog had the highest relative importance (all 33.3%).

Table 4.12 Scenario 4: Play activities that require little or no parental involvement

		No. groups endorsed	Which groups endorsed	Highest potential score	Sum of scores	Relative importance %
1	Small world	6	1,2,3,4,5,6	40	25	62.5
2	TV	4	3,4,5,6	24	10	41.7
3	Role play	6	1,2,3,4,5,6	40	15	37.5
4	Drawing & painting	5	2,3,4,5,6	31	10	32.3
5	Construction	4	1,2,4,6	40	12	30.0
6	Board games & puzzles	3	1,5,6	40	10	25.0
7	Dressing up	5	1,2,3,5,6	40	9	22.5
8	Making music	1	4	6	1	16.7
9	Dancing	3	1,2,4	33	5	15.2
10	Playing on furniture	2	1,6	29	4	13.8
11	Balloons	1	1	9	1	11.1
12	Sand play and water play	2	1,2	40	4	10.0
13	Singing and action rhymes	2	1,6	33	3	9.1
14	Writing	1	5	11	1	9.1
15	Dens	2	1,4	35	3	8.6
16	Tablet / phone	1	6	24	2	8.3
17	Audio books	1	3	12	1	8.3
18	Playing with the dog	1	1	13	1	7.7
19	Crafts and junk modelling	1	5	40	3	7.5
20	Reading & story telling	2	2,3	40	3	7.5
21	Playing with another child	1	2	31	2	6.5
22	Ball games	1	5	33	2	6.1
23	Trampolining	1	5	26	1	3.8
24	Playing in the garden	1	4	31	1	3.2

Small world, role play, and construction were the top three activities that parents felt required little or no supervision. Small world had the highest relative importance of all activities in all scenarios (62.5%). Fewer activities were chosen for this scenario than the other three (24 versus 29,30,30) and there was less distribution of scores than other scenarios with the top five play activities receiving over half of the votes (55.8%). This indicates that parents feel their involvement is necessary for most of the play activities suggested.

Small world was in the top three activities for all four scenarios. Role play and dressing up were in three and construction in two of the top three of the four scenarios. Table 4.13 presents the activities within their physical activity intensity category that are ranked (with the highest scoring activity being ranked first) with their combined sum of scores for all for scenarios. Because moderate to vigorous intensity was not specifically split into 'On the Go' (moderate) and 'Huff and Puff' (vigorous) until the penultimate focus group it has not been included in this table. However, it is likely that activities that fall under 'Pottering to Huff and Puff' would fit under the 'On the Go' category.

Table 4.13 summarises the results of the modified NGT focus groups and provides activity examples for each physical activity intensity category.

Table 4.13. Play activities by physical activity intensity description, ranked by the relative importance of the four scenarios combined.

Physical activity intensity	Rank+	Play activity	Relative importance %*
All	1	Playing with another child	14.5
	2	Playing with a parent	8.0
Still	1	Television	17.7
	2	Board games & puzzles	16.3
	3	Tablet / phone	13.5
	4	Reading & story telling	12.5
	5	Stickers	9.1
	6	Writing	6.8
	7	Audio books	2.1
Still to pottering	1	Construction	16.9
	2	Drawing & painting	16.1
	3	Crafts and junk modelling	5.6
Pottering	1	Small world	29.4
	2	Role play	24.4
	3	Dressing up	22.5
	4	Singing and action rhymes	16.7
	5	Helping around the house	15.5
	6	Hair & make up (with parent)	14.3
	7	Making music	12.5
	8	Sand play and water play	10.0
	9	Messy play	9.2
	10	Playing in the bath	6.6
	11	Experiments	4.2
	12	Cooking and baking	2.9
	13	Listening to music	1.9

	14	Gardening	0.8
Pottering to Huff and Puff	1	Playing in the garden	13.7
	2	Hide and seek	9.1
	3	Dens	7.1
	4	Push along or ride on toys	4.2
Huff and Puff	1	Rough and tumble	29.2
	2	Playing on furniture	12.1
	3	Balloons and bubbles	11.1
	4	Dancing	10.6
	5	Trampolining	10.6
	6	Ball games	9.1
	7	Playing with the dog	7.7
	8	Scooting and cycling	2.9
	9	Obstacle courses	2.8
	10	Running games	1.0

+ Rank within the physical activity intensity

* Relative importance with all four scenarios combined ([total sum of scores across all 4 scenarios / total highest potential score over all four scenarios] X 100).

4.4. Discussion

There is a considerable amount of research focused what are appropriate recommendations for physical activity and sedentary behaviour for different population groups [80 86 89 90] and increasing evidence is available on the frequency, intensity, duration and type of physical activity necessary for health benefits[2 3 80]. However, there is a lack of information about how to effectively communicate this information to population groups[157]. Understanding target audiences and their information preferences has been cited as a priority for all health promotion initiatives[158] , and it is imperative that parents views are considered when communicating physical activity and sedentary behaviour guidelines for preschool children.

Study 1 identified that mothers found it difficult to define and quantify physical activity in preschool children, meaning that their estimations of their child's activity levels may not be accurate. For mothers to instigate an increase in physical activity and reduction in sedentary behaviour, they first need to recognise that there is a need to do so. This study aimed to understand how the physical activity guidelines could be improved to help parents define and quantify physical activity for their preschool child by addressing the following research questions: 1) What words or phrases can be used to describe physical activity intensities in preschool children that are helpful and informative to parents?; 2) What specific play activities illustrate these physical activity intensities and to help parents initiate and promote physical activity for their preschool child? How the results of this study helped to answer these research questions are discussed, in turn, below.

4.4.1. What words or phrases can be used to describe physical activity intensities in preschool children that are helpful and informative to mothers?

The results of this study presented alternative terms for sedentary, light, and moderate to vigorous levels of physical activity intensity in preschool children. Providing easily understandable terms and descriptions of the physical activity intensity categories may help parents recognise what counts as physical activity.

There was some debate as to whether the term 'Still' was the most appropriate to use for sedentary activities as many parents felt that their preschool child was never physically still. Although alternative terms were discussed, participants did not reach agreement with any of them. After discussion parents agreed that, even if only for a moment, whilst their child was focused on a sedentary activity (e.g. reading) they were being still, and all focus groups concluded that this term was acceptable. It was apparent that parents valued this time as a period of rest (for the child or parent) and as a time when the child may be engaged in educational activities. Parents felt that the term 'sedentary' portrayed a negative behaviour such as being disengaged or lazy and did not approve of its use for describing activities of this intensity level (e.g. reading, writing, and drawing). Previous research has also suggested that parents of preschool children value sedentary time [124 128 129]. For instance, in a qualitative study on parents' perceptions of the Canadian Sedentary Behaviour Guidelines for the early years, it was reported that parents felt that children need the calmness and 'downtime' that comes with sedentary behaviours in order to balance out periods of high energy. In addition, reading and colouring, which are considered sedentary activities, were felt by parents to be critical

to children's development and parents felt that they should not be advised to minimise that time[124]. Thus, caution should be taken when using the term 'sedentary' in health promotion materials for this age group.

At the time that the focus groups were carried out, the UK physical activity guidelines for the early years (Appendix 5) advised that time being sedentary should be reduced, and used screen-viewing and time spent in a pushchair of car seat as examples of sedentary behaviour[9 159]. The most recent national physical activity guidelines for preschool children have been produced in Australia in 2017[85]. Under a heading of sedentary behaviour, these guidelines advise that time being restrained (e.g. in a car seat or pushchair) should not exceed 1-hour at a time and screen viewing up to 1-hour in total per day. They also suggest that reading, singing, puzzles and storytelling with a caregiver are encouraged. The benefit of this is that parents can be clear about which sedentary behaviours do not need to be restricted according to the guidelines. As parents felt that sedentary behaviour is associated with activities in which children are not engaged and has negative connotations for them, the term Still may be a suitable alternative to use in guideline material such as these, as parents found this term included activities in which children are engaged such as reading and puzzles.

'Pottering' was viewed positively by parents in the focus groups. Parents' felt that the meaning was clear and gave a visual image of the appropriate intensity activity. However, it is important to note that for a parent with English as a second language, the term was colloquial and not easily translatable. As there was only one parent in the

focus groups with English as a second language, it would be important to test this term further with a wider population to gauge its acceptance. This is a new addition to the vocabulary used in physical activity guidelines and may support parents understanding of light-intensity physical activity. At the time of the focus groups, the UK guidelines information for parents described light-intensity activity as 'light activities', but failed to describe or provide examples of what activities may be considered light activity and the examples that were provided for physical activity were all of a higher intensity[159]. The recent Australian 24-hour movement guidelines for preschool children simply state that the recommended 180 minutes should be spent in a variety of physical activities, of which at least 60 minutes is energetic play. There are no examples or descriptions of what may be included as physical activity. Using the term pottering may compliment these guidelines by helping parents differentiate between sedentary activities such as reading with light-intensity activities such as construction, and therefore provide a better understanding of what counts as physical activity.

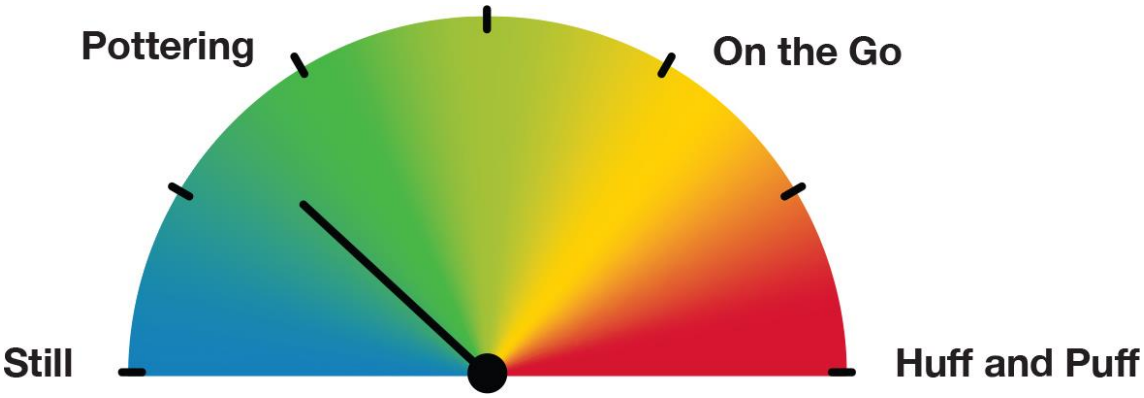
The term Huff and Puff was approved by parents in the focus groups and they felt that it was a good term to use in this context. As with Pottering, parents appeared to appreciate the visual image that the term provided. However, during the first focus group, parents reported that they did not find categorising moderate and vigorous intensity physical activity together helpful, as the type of play for each intensity is different. The remaining focus groups discussed terms that could be used to describe 'moderate' intensity physical activity as a separate category. The term "On the Go" was favoured by parents within a later focus group to describe moderate intensity activity. One mother within the interviews in Study 1 also used 'On the Go' to describe play of a

moderate intensity. This term was not presented to all focus groups and needs further testing to assess its suitability. Huff and Puff was thought to be a suitable term to describe vigorous intensity in preschool children. Both the UK guideline information for parents and the Australian 24-hour movement guidelines combine moderate-to-vigorous intensity activity and describe it as energetic play. The UK guidelines use examples of climbing frame or riding a bike for energetic play and running and chasing games for more energetic bouts of activity. The Australian 24-hour movement guidelines do not give any specific examples of energetic play. Splitting moderate and vigorous intensities in to two distinct categories of activities may help parents understand their child's physical activity patterns and levels. In keeping with other studies[129], this study found vigorous intensity physical activity in preschool children could be challenging for parents (e.g. children's behaviour when playing at this intensity was described as disruptive and parents reported that their child found it difficult to calm down afterwards). This is an important consideration when recommending an increase in physical activity for preschool children, as it may present a barrier to behaviour change. As the Australian guidelines advise that at least 60 minutes of the 180 minutes recommended physical activity should be spent in energetic play, it may help parents to understand that this can include moderate (On-the-Go) activities as well as vigorous (Huff and Puff) activities with examples of each to provide clarity that their child is not necessarily being advised to be vigorously active for 60 minutes per day, which may feel unachievable to some parents.

As in previous literature[125], analysis of the focus group data suggested that thinking of preschool children's physical activity within intensity categories is problematic. Within

the focus group discussion, parents in felt that it would be helpful to view it on a spectrum or scale. Parents found categorising some play activities into one intensity difficult and chose to place some activities in between two intensity categories, highlighting the concept of activity occurring on a spectrum rather than distinct categories. Therefore, the concept of physical activity intensity for preschool children on a spectrum may be a valuable approach to presenting guideline information to parents. An example of such an approach can be found in Figure 4.4.

Figure 4.4. An example of presenting physical activity intensities on a spectrum, using the terms developed in this thesis



4.4.2. What specific play activities illustrate these physical activity intensities to help parents initiate and promote physical activity for their preschool child?

By the end of the six focus groups, parents had suggested sixty different play activities. The most prevalent play activities suggested by parents, which were provided by all six groups, were ball games, construction, cooking and baking, drawing, dressing up, role play, and small world play. Role-play, dressing up, small world play and construction

were the highest scoring activities overall. The majority of activities parents categorised as 'Pottering' activities, which is in line with research that suggests the majority of preschool children's play is at a light intensity[29]. Parents' felt that some activities were difficult to categorise under one physical activity intensity, as it was dependent on how the child was playing that activity and so chose to place the activity between two intensity categories (e.g. Still to Pottering). This highlights the difficulty in categorising play activities into different physical activity intensity categories and suggests it would be more appropriate to think of intensity on a spectrum.

The scores for scenario 1 (play activities that hold your preschool child's attention the longest) and scenario 2 (play activities that require little or no encouragement from the parent) were widely distributed across play activities indicating a variation of play preferences between children. However, the scores for scenario 4 (play activities that require little or no parental involvement) had less variation with over half the total scores going to the top five activities. This suggests that most of the play activities suggested, require the parents' involvement. Considering that one of the most commonly cited reasons for screen-viewing in preschool children is the need for parents to have their child entertained or 'baby-sat'[127-129], information for parents on how to support a child to play independently may be beneficial in reducing screen-time. Indeed, television viewing had the second highest relative importance for this scenario.

There was some indication that parents' perception of the intensity of activities was influenced by their personal context. For instance, it appeared that older and working

parents categorised activities with a higher physical activity intensity than younger or non-working parents. A group of mothers predominantly of girls categorised activities with a lower physical activity intensity compared to other groups with a higher boy/girl ratio indicating parents' perceptions that physical activity in preschool children is gender driven[129]. Although a certain amount of agreement as to which physical activity intensity an activity should be categorised was present across the groups, it is likely that categorising play activities into a physical activity intensity is subjective and dependant on the child.

4.4.3. Key issues for presenting physical activity guideline information to parents

The results of Study 2 provide relevant and practical examples of play activities to illustrate different intensities of physical activity, which may be valuable for health promotional material. In addition, several issues were identified that should be addressed when presenting physical activity and sedentary behaviour guidelines information to parents. These have been summarised in Table 4.14.

Table 4.14 Key issues for presenting physical activity guideline information to parents.

Use of language and terminology
Parents associated the term 'sedentary' with being lazy or disengaged and feel it does not reflect activities that may be sedentary in intensity but in which the child is engaged (e.g. storytelling, crafts).
Vigorous intensity physical activity was viewed as a challenging behaviour in preschoolers by some parents, which may pose as a barrier to behaviour change.
The terms 'Still', 'Pottering' and 'Huff and Puff' were found to be suitable alternatives to sedentary, light and vigorous intensity physical activity respectively. 'On the Go' was suggested for moderate physical activity between pottering and huff and puff, but needs further testing.
Presenting physical activity intensities
Physical activity intensities should not be categorised together, i.e. moderate to vigorous intensity, as forms of play within these two intensities are different.
Guideline information should provide a description for each physical activity intensity level stated.
Physical activity intensity categories are difficult to apply to preschool children's play activities, thinking of physical activity intensity on a scale or spectrum is more useful to parents.
Providing examples and illustrations
The top 3 activities (ranked by relative importance) for each intensity (as categorised by parents) are: **Still:** Television, board games and puzzles and using a tablet or smart phone. **Still to Pottering:** Construction, drawing and painting, crafts and junk modelling **Pottering:** Small world, role play and dressing up **Pottering to Huff and Puff:** Playing in the garden, hide and seek, making dens **Huff and puff**: Rough and tumble, playing on furniture, balloons and bubbles

1.4.2. Strengths and limitations

The modified NGT methodology provided a novel and flexible means of gathering a large amount of data within a short period of time. This method enabled in-depth discussion whilst minimising peer influence and allowing for equal representation from all participants. The modified technique of using coloured stickers rather than voting sheets provided an instant visual summary, which could be discussed with participants during the focus group session.

The three terms generated in the first phase of Study 2 (Still, Pottering and Huff and Puff), provided a starting point for discussion of how to describe physical activity intensities in preschool children. Although data from focus groups provided evidence that parents view the terms and descriptions favourably, additional information may be required before recommending their use as alternative terms for physical activity intensity categories. For instance, the forty participants that took part in this study were all from Bristol UK., and the majority were White British Mothers. Thus, it is not known whether the results from this study can be generalised to other parts of the UK, with other ethnicities or with fathers of preschool children. Assessing the results from this study with these groups represented is essential before they can be applied nationally.

1.1.3. Conclusions and future research

The aim of this study was to explore parents' views of alternative terminology for physical activity intensities and activity examples to illustrate each intensity in order to

indicate how parents could be better supported in understanding and acting on the guidelines. The results provided alternative terms of physical intensity categories for preschool children and suggestions of play activities that may be used as examples of play activities for each of these categories to help parents identify when their child is achieving the physical activity guideline targets.

The terms and descriptions of physical activity intensities produced within this study were viewed favourably by parents. However, as the study sample included predominantly White-British mothers residing in Bristol, UK, it is not known how acceptable the use of these terms and descriptions would be with fathers, parents of different ethnicity and residing in different areas of the UK. However, the in-depth nature of this study gives value beyond the context by providing concepts that have potential to be generalizable to other readers and settings [160].

Parents had difficulties in categorising some play activities according to their intensity and often felt that an activity may fall between two categories dependant on how it was being played. Therefore, an additional and important implication of this is that it is likely that using self-report measures to describe physical activity intensities is not effective and suggests the need for objective measurement to assess physical activity intensity and self-report to assess types of behaviour.

CHAPTER 5. PARENTS' VIEWS ON RECEIVING THE PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR GUIDELINES.

5.1. Introduction

As discussed in Chapter 3, the results of Study 1 identified four key issues that may prevent positive physical activity behaviour change in preschool children. Chapter 4 presented the results from the focus groups that related to helping parents define and quantify physical activity in their preschool child. This Chapter address the following issues:

- Mothers were not aware there are physical activity and sedentary behaviour recommendations for preschool children;
- When presented with the UK physical activity and sedentary behaviour guidelines for the early years, mother felt they did not provide enough information about what counts as physical activity and how the recommendations can be achieved for them to be constructive.

Knowledge of physical activity guidelines has been found to have a positive influence on behaviour change[18], yet awareness of physical activity guidelines is low within the general population[161 162]. Thus, more effective dissemination of guideline information is needed. This current chapter presents the second part of the results from the focus groups (Study 2) which investigated parents' views on the communication and dissemination of the physical activity and sedentary behaviour guidelines. The aim of

this study was to establish parents' preferences for communication and dissemination of physical activity and sedentary behaviour guideline information.

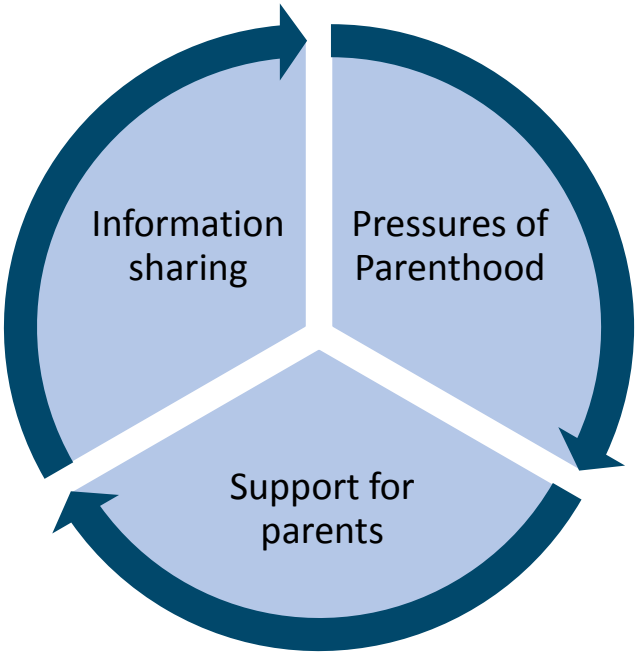
5.2. Methods

Parents of children aged 2 to 4 years old were recruited through social media, nurseries, preschools, and by word of mouth from varying IMD areas within Bristol UK. The topic guide relevant to this study included items regarding views and preferences towards the communication and dissemination of physical activity guideline information. The full focus group discussions were included in the analysis. The methods for this study can be found in chapter 4.

5.3. Results

Participant demographics are reported in Chapter 4. Analysis of the data resulted in three overarching themes (Figure 5.1): information sharing; the pressures of parenthood; support for parents. These themes are related to each other, i.e. sharing information of the physical activity and sedentary behaviour guidelines increased the existing pressures experienced in parenthood, resulting in a need for additional support and information, which in turn needs to be shared with parents. Each theme was supported by a number of sub-themes, which are reported below with illustrative quotes. Focus group number, participant number, and if they were a mother or father are shown for each quote.

Figure 5.1 Parents' views of receiving the physical activity and sedentary behaviour guidelines



5.3.1. Information sharing

The practicalities of receiving the physical activity and sedentary behaviour guidelines, such as the format it is presented in and where the guidelines are received from were discussed.

Printed media vs digital information

Several formats for receiving the physical activity and sedentary behaviour guidelines were discussed within the focus groups, including printed media, online sources, mobile applications (apps) and sharable videos. The benefits of printed media for some participants where they felt they would be more likely to take notice of a leaflet or booklet that was presented to them rather than intentionally looking for information online. Some participants felt that it would be useful to have something physical to refer

to if they needed information straight away. One parent described the print format as a 'friendly' way of receiving information. Another parent liked the idea of a book with information and play ideas they could look at with their child. The negative aspects of receiving printed material for some participants were they felt they received too much printed information already and were more likely to dismiss it or throw it away having read it.

> *"I personally like having booklets, I must admit. I find that if they're on the computer I'll maybe open it up and then not get round to reading it. So having something – I like having something that's physically there." G4. P40 Mother, IMD 1, girl, age 4*

Receiving information from online sources was preferred by some participants because it was easily accessible and available to parents who wanted the information. Parenting websites, such as Netmums, BabyCentre and Mumsnet were mentioned as useful sources of health information for their children. Participants felt a benefit was that online information can be easily updated allowing the advice to be current. However, some participants found information from online sources was not always reliable and often provided conflicting information.

> *P33: But would you keep that though, a leaflet, because I think if I was given that I wouldn't keep it…*
> *P32: However much I think like books and magazines I just don't use them. I look at them once and go 'this is great!' and then put it away and then with all the other books. So yeah for me online would be better or an app maybe. G2. P33, Mother, IMD 4, boy, age 4 & P32 Father, IMD 2, boy, age 3.*

One group discussed the merits of having an app (mobile application) containing physical activity and sedentary behaviour information and activity ideas. Participants liked the idea that an app could be interactive, so users could upload their own activity ideas and tips. However, some participants felt caution should be taken not to make an interactive feature competitive, as this may lead to more stress for parents. An app also had the advantage of being adaptable and tailored so activity ideas could be made relevant for the season, weather or even the developmental stage of the child.

> *P32: I think an app would be great*
> *[Group agreement]*
> *P32: I just think it's got lots of potential for being updated, for putting pictures on, putting videos for like …*
> *P37: Kids could have look as well and they can interact with.*
> *P28: Maybe if you're putting on what you've done with your children you can physically see that and what you've done that week with them… So like 'this week we've done this' and if it's something I could show to other mums.*
> *P25: Yeah, like it's winter at the moment, why don't you do blah-blah-blah, and this will link into their development by … and because we're all quite interested about their development and things.*
> *G2. P32 Father, IMD 2, boy, age 3; P37 Mother, IMD 3, boy, age 3; P28 Mother, IMD 5, girl, age 3; P25 Mother, IMD 1, girl, age 4.*

A short online video campaign was mentioned as a good way to communicate physical activity information by some participants. A sharable video, such as a recent campaign by the British Heart Foundation, which showed a celebrity demonstrating CPR[163] was thought to be more attention grabbing than printed media.

P49: You know, like the mini-video thing for CPR…

P51: Yeah. Short and sharp.

P49: …that would be something that would get my attention more than actually a booklet.

G5. P49 Mother, IMD 2, boy, age 4 & P51 Mother, IMD 4, girl, age 4.

Real-world community Vs Online community

Participants often used the word 'community' when talking about knowledge and information sharing. This applied to the community in which they lived and to the online community, and a sense of unity with other parents appeared to be important to parents.

Community settings, such as groups run by schools, preschools and children's centres for example, were discussed as reliable and trusted sources of information. Receiving physical activity information verbally through a one-to-one conversation with an early-years professional or through a led parenting group was viewed as positive way of receiving information and parents felt they were more likely to pay attention to this than to something they needed to read.

"I think if they did something at nursery or preschool where they invited you along and went through bits of it [physical activity guidelines], you'd kind of take it in a bit more… Then you'd go along because you think, you know that you need to know it for your child rather than getting something and read it." G4. P43, Mother, IMD 2, girl, age 3.

An idea suggested by participants as a positive way to receive physical activity information was parenting groups about physical activity, in which their children could attend. Part of the reason for this was to be with like-minded people in the same situation to share tips and ideas.

> *P57: I think the schools should introduce groups as well.*
> *P57: Yeah, because I'm doing a healthy eating cooking one, which is being based here as well and come with the children and they can all get involved.*
> *P59: It's nice that you've got support there…. I think it's nice just to get out there and meet new mums and see what their children are like. Just see if you can pick up any … like it is tips, sharing some tips. G6. P57 Mother, IMD 4, girl, age 2, & P59 Mother, IMD 4, boy, age 3.*

The ability for community settings to provide a supportive environment was viewed as a positive factor to receiving guideline information. Peer-support appeared to be important for many parents.

> *"Yeah and where it comes from I think is important so if the government somehow, if like community is telling you something so if you're alongside a group seeing other people doing things that kind of softly softly feels better people on your level if it feels like it's coming from the top then people just suddenly get like they're telling me what to do." G5, P47 Mother, IMD 3, boy, age 4.*

The online community came from parenting groups on social media sites such as Facebook and forums on parenting websites. Participants appreciated the range of opinions and experiences available on these groups, and the possibility of anonymous

support. However, many participants felt that the information provided by groups such as these were not reliable and only based on opinion. In addition, some participants had negative experiences from using social-media or forum parenting groups, such as their posts turning into unfriendly debates.

> *P39: The thing about Netmums and Mumsnet is I suppose it exposes you to people with various opinions. There's so many different opinions in bringing up your child isn't there and actually it can make you see things a bit differently rather than being narrow about it.*
>
> *P10: Yeah but it doesn't necessarily mean they're right, I think you have to be careful because sometimes you can feel a bit vulnerable as a mum a bit unsure of yourself and you have to be careful not take other people's advice, opinions too seriously because they might not be right. G3. P39, Mother, IMD 3, girl, age 4, & P10, Mother, IMD 3, girl, age 4.*

> *P 59: Yeah the only problem with it is when you do get your bitchy mums that seem to…*
> *P53: Yeah like there are mums who start to think that they know everything and then your opinion is wrong… it's like it's just a group, it's not a debate. G6, P59 Mother, IMD 4, boy, age 3, & P53 Mother, IMD 5, boy, age 3.*

The tone of communication with parents is important

A "top-down" or "authoritarian" approach, which parents' considered the guidelines to have, led to feelings of pressure to conform to an ideal standard, that some parents felt may be unachievable. This in turn led to feelings of stress and guilt.

P39: I get a little bit frustrated with this idea that children should have all of these achievements that they have to reach. Like I just – I get quite defensive I suppose is the right word. I get quite defensive about it…
P10: Yeah pressure to conform, pressure to behave in a certain way, pressure to have expectations on a child so young.
G3. P39 Mother, IMD 3, girl, age 4, & P10 Mother, IMD 3, girl, age 4.

These feelings appeared to disengage parents from the guidelines and some commented that they would actively reject them.

I would automatically dismiss it, make me almost rebel against it. G3, P3 Mother, IMD 3, girl, age 3.

Participants also cautioned against the guidelines becoming patronising or prescriptive as this would be off-putting.

P47: But being told here is some ways that you can play with your child…
P51: It's a bit patronising isn't it.
P47: Yes exactly
G5. P47 Mother, IMD 3, boy, age 4, & P51 Mother, IMD 4, girl, age 4

P57: It needs to be more along the lines of help your child get active you know it sounds less, you need to do this suggestion straightaway.
G6. P57 Mother, IMD 4, girl, age 2.

5.3.2. The pressures of parenthood

Participants discussed the how receiving physical activity and sedentary behaviour information may add to the existing pressures of parenthood.

Parenting is challenging

Feelings of pressure and guilt at believing that they are not doing enough to support their child's physical activity according to the guidelines, led parents to suggest that sensitivity was needed when communicating the guideline information. These feelings seemed to stem from parents' perceptions of what is expected of them and their child from health professionals, family members and peers. Participants felt they were responsible for providing opportunities for their child to facilitate their development. This was discussed as a modern cultural trend, and parents talked of these expectations often being formed when parents compared themselves and their child to other parents and children. Social media was seen as exacerbating the problem.

> *I think social media and even some of the parenting websites have a lot to answer for, they set these sort of unrealistic ideals. G6. P53 Mother, IMD 5, boy, age 3.*

> *P19: You go on Facebook and there's all these happy mummies with all these incredible creative things that they've done that are absolutely fabulous, but if you're feeling a bit shit that week …*
> *P32: Yeah, yeah.*
> *P19: Sometimes it can be inspiring but other times it can make you feel 'well, I'm just terrible because… because I haven't done this'.' [Group agreement] G2. P19 Mother, IMD 2, boy, age 4, & P32 Father, IMD 2, boy, age 3.*

There was a suggestion that this was a phenomenon particularly prevalent in the UK, as a mother from France highlighted the cultural differences between the two countries:

> *"Here [in the UK] you just stop working for a year to take care of your baby so you're a one to one situation whereas for us in France we just go back to work when the baby is 2 ½ months so he is at nursery and we don't have this pressure that you have here, like he can't do this and he can't do that and you're really proud of your children when they can do something different and having that every day I think it's not easy." G5, P46 Mother, IMD 3, boy, age 2.*

Participants talked about the time pressures of being a parent of young children and this may limit their ability to read any guideline information. For some participants, physical activity did not feel like a priority and so they felt this would prevent them from taking notice of physical activity guideline information.

> *"I might go on the iPad but unless I have to read it, it doesn't matter what sort of format it was in. Unless it's like, you've got an appointment then and you've got to read this. [laughs]. I really don't get time really. I know it's really mad but I don't." G4. P40 Mother, IMD 1, girl, age 4.*

Having an active child at home is difficult

Enabling physical activity within the home appeared to be problematic for parents. This was especially pertinent when children needed to be at home for long periods e.g. because of bad weather or having a poorly sibling. Some participants described days

such as these as exhausting and challenging, and reported they lacked inspiration of activities that they could do.

> *"If I saw that [information on the physical activity guidelines] pop up I'd probably would click on it and I'd think oh you know what I could do in terms of ideas for rainy days or whatever you know". G5. P48 Mother, IMD 2, boy, age 4.*

> *"Some days you're fine and you're like 'oh, we're going to do this, we're going to play this' and it's great and your child's really into it. Other days you're like 'argh, I can't really think of anything to do' and they can't really think of anything to do… Whereas if you're just like 'oh, I can have a quick look' and 'oh, shall we try this?'… 'yeah, let's look at this' or 'let's play this game'." G2. P32 Father, IMD 2, boy, age 3.*

Many participants talked of the difficulties of encouraging their preschool child to play independently. Participants discussed how there were few activities that their child would play without involvement of the parent, which was tiring and restricted the time available for parents to do other things. For this reason, participants said that they often turned to the television as this would prevent the child from being reliant on them.

> *"I don't know how much of an influence comes from us but I don't think my son would ever play by himself, he's always wanted hands on interaction which is why we resort to the TV because it's relentless, I literally have no time at all." G5, P50 Mother, IMD 3, boy, age 3.*

Participants found their personal situation influenced their ability to encourage play activities within the home. For instance, a few participants who had a preschool child and a baby talked about the difficulties of doing activities with their preschool child because of the different play styles of these ages. Other situations participants reported to make active play difficult included families that do not have a garden, families with no car, single parents, and multiple children with differing needs.

> *P23: I think for me, the huff and puff stuff outside is easier to do with a one-year-old and a three-year-old who are both very, very energetic. It's the quieter stuff at home which is harder to do.*
> *Facilitator: And what's difficult about the activities at home?*
> *P23: Because the younger one eats whatever the other one is playing with. And the older one gets frustrated that the baby keeps grabbing the puzzle pieces or grabbing the dolls, the hair brush, or trying to eat some toy. It's exhausting. G1. P23 Mother, IMD 4, girl, age 3.*

5.3.3. Support for parents

The guidelines need to provide clearer messaging

Three groups discussed the need to have information to help parents understand what counted as physical activity according to the guideline recommendations. Many participants felt the guideline recommendation of three-hours of varying physical activity, throughout a day, needed to be clearly communicated to avoid parents believing that their child needed to be vigorously activity for three continuous hours.

> *I find that a little bit imposing and a bit restrictive [the physical activity recommendations] because I think if you just saw that you need to do three hours a day, the instant thing in your head is that*

they should be outside running around doing Huff and Puff for three hours a day that's not practical. G2. P37 Mother, IMD 3, boy, age 3.

P49: It shouldn't be looked at a day in isolation
P48: Yeah it needs a good explanation that goes with it. I suppose there's no real short concise way of getting that across enough G5. P49, Mother, IMD 2, boy, age 4, & P48 Mother, IMD 2, boy, age 4.

The guidelines need to provide more information

Participants felt that there was not enough information available to help them feel informed about the guideline recommendations and how they may be achieved. Supplementary information offering advice on the difficulties parents experience from active play within the home were thought to be worthwhile. This included advice on activities at home that offered an alternative to screen viewing and contributed towards the child's daily physical activity. An important part of this for many parents was advice on supporting a child to play independently, to reduce their reliance on screen-viewing. Information for specific situations such as activity ideas for within home that included when parents had a baby, more than one child, no access to a garden, or limit resources. Some parents suggested that activities ideas could be relevant to the developmental stage of the child, especially as a 2-year-old plays very differently to a 4-year-old.

P32: He had a lot of behaviours that were really frustrating, like he'd throw stuff around the house all the time and once we took him to nursery I said 'look, he's throwing stuff everywhere, like literally can't have anything lying around, he just throws it' and they said 'but that's actually this particular learning phase'. And the fact that they could understand that that was actually part of a developmental phase he was going through they could incorporate it into his play.

P15: Yes definitely, play activities that link to developmental stages would be really good. G2. P32 Father, IMD 2, boy, age 3, & P15 Mother, IMD 5, boy, age 2.

Some participants felt that currently there were no easy ways of finding out about activities in their local area and said they would value a resource that provided this information. One group discussed that this resource could be interactive, so parents could add events and activities.

P53: Like local activities would be good as well, they're not really put out there enough either, if you know what I mean so I think that would be good for that to be more advertised, local activities.
P57: It's really hard to find out sometimes what's going on in the area.
P53: You could have something that people can add to and, if anything comes up. And you hear about that from other mums, which is great. G6. P53 Mother IMD 5, boy, age 3, & P57 Mother, IMD 4, girl, age 2.

Some participants felt that it may be helpful to receive some information on physical activity for their child before they reach preschool age to prevent habits being formed. Some suggested that this could be done through ante-natal groups or from health visitors during the child's routine one-year check-up.

5.4. Discussion

5.4.1. Communicating physical activity and sedentary behaviour guidelines to parents

The data from this study suggests, to engage parents, the physical activity guidelines for the early years need to be sensitive and understanding to their feelings of pressure and guilt. Faulkner and colleagues, in their study on perceptions of the Canadian 24-hour Movement Guidelines for Children, also reported that parents felt the guidelines were just another thing to worry about and potentially could cause feelings of guilt, and so suggested that communication of the physical activity guidelines need to be supportive and inclusive rather than prescriptive[164]. However, participants in this study felt that physical activity and sedentary behaviour guidelines are presented in an authoritarian way, that increased feelings of stress and guilt. Interventions based on behaviour change communication often rely on 'top-down' programs, which have been reported to create feelings of mistrust between the practitioner and public caused by a feeling of "blaming the victim"[165]. Thus, avoiding didactic communication from expert to public may alleviate some of the pressure and guilt parents feel when presented with physical activity and sedentary behaviour guidelines. In addition, health promotion programs that provides a supportive environment and enable people to empower themselves to make healthy lifestyle decisions may be more effective than a conventional 'top-down' approach[165 166]. Balance is needed when communicating physical activity guidelines because, although target audiences need to be able to identify with a need for change, messages should avoid being prescriptive or patronising as parents in this study and others[167] have reported that this would be off-putting. Positive, gain-framed messages

that encourage self-efficacy are likely to be more effective for engagement and behaviour change than promoting negative consequences[139].

5.4.2. Parents would like more information to supplement the guidelines

Clear and informative explanations of the physical activity guideline recommendations would be helpful for parents, who in this study reported difficulty in understanding what counts as physical activity for their preschool child. They also felt it was easy to misinterpret the three-hour of physical activity per day, believing this would need to be three continuous hours. Similarly, physical activity guidelines that had a holistic approach and put the whole day in perspective were appreciated by parents in a qualitative study on perceptions of the Canadian 24-Hour Movement Guidelines for Children and Youth[164].

Participants in this study felt they would like to see more information and advice presented along with the guidelines. For instance, parents said they would welcome ideas of play activities they could do at home and that would count towards the physical activity recommendations. Providing ideas would assist in illustrating what counts as physical activity for preschool children and may also help encourage physical activity within the home. These ideas could also incorporate play activities suitable for different stages of development as this was of interest to parents in this study. Having a resource that provides information of what activities are available in the local area was also discussed by parents within this study, which links well with their preference for community-led health promotion.

It may be important to provide information and advice to alleviate some of the barriers parents identified to play within the home, such as having a baby or more than one child, not having a garden or having limited resources. Tailored advice to account for these specific needs was welcomed by some parents and may help parents support their preschool child to achieve the guideline recommendations. Health communication that is relevant to its intended audience has been reported to be more effective than those that are not[168].

5.4.3. Dissemination of the physical activity and sedentary behaviour recommendations

A number of different channels for disseminating physical activity guidelines were mentioned by parents in the focus groups. The three main channels discussed were through community-based settings such as preschools and health visitors, social media, and through parenting websites.

The data from this study suggests that receiving the physical activity guidelines from a reliable and respected source is important to parents. Many parents talked about receiving information via community settings and a strength of community-based organisations is their ability to deliver a supportive, bottom-up approach[169], which parents in this study welcomed. Receiving information from schools and children's centres, especially in a parent-group setting, was suggested as a positive way to receive information, and has the additional advantage of being able to facilitate peer support. Some parents felt that receiving information directly from a health professional (e.g. community health visitor) would encourage them to take notice of the physical activity

guidelines and receiving information this way may also ensure credibility and trustworthiness[164].

It is likely that using several channels would be the most successful way of reaching a larger target audience [164] and it may be advantageous to take this into account parents desire for a sense of community and peer-support for all channels used. For example, parents within these groups regularly used local parenting groups on social media for support and advice. Therefore, a social media campaign that tapped into the online-community and peer-led nature of these groups may be effective. Social media has the additional benefit of being low-cost and being able to use real-time messages to reach large numbers[158]. However, caution is needed to prevent negative interactions between parents as this was a concern of participants.

It has been reported that 8 in 10 internet users look online for health information[170] and participants in this study reported that they commonly used parenting websites (e.g. Babycentre, Netmums) as a reliable source of health information for their preschool child. Therefore, providing physical activity and sedentary behaviour guidelines on these websites may be worthwhile. However, as some parents pointed out in their discussions, having information available on websites is reliant on people actively looking for the information. As physical activity for their preschool has reported not to be a priority for parents (Chapter 3) it is unlikely that they will actively seek this information, therefore additional signposting may be needed.

5.4.4. The preferred format of the physical activity and sedentary behaviour guidelines

A number of formats to receive physical activity guideline information were suggested by parents including printed media (e.g. leaflets), internet (websites, social media, and viral video campaigns), mobile apps, and directly from health professionals. It is likely that a combination of these formats would be most effective to meet different preferences.

There were differences of opinion as to whether print media or internet sources are the best format of receiving information, and it may be that providing both print and internet sources is optimal to account for these personal preferences. It was indicated by parents in this study that printed media would be more appealing if it was a resource of ideas and advice that can be referred back to rather than just outlining the guidelines. Internet sources most commonly discussed by parents were pre-existing parenting websites, in which parents trusted for information and advice. Being able to trust the source of information was important to parents and so these parenting websites may be an appropriate platform to promote physical activity and sedentary behaviour guidelines. An issue with information provided by the internet, which was mentioned by parents in this study, is that it can be contradictory from one website to the next. Consistency in health promotion messaging is important to avoid misinformation and confusion[162], therefore guideline information promoted from multiple sources needs to ensure reliability.

Another format discussed by parents was the possibility of having a mobile app to provide information on physical activity for preschool children. There is an extensive range health-related apps available for commercial use that have the potential to reach and engage target groups in health related behaviour change[171] and so may be a useful way of engaging parents with the physical activity and sedentary behaviour guidelines. Like websites, apps have the ability to provide real time information which could be useful when making information and ideas more situation specific, but may rely on parents being proactive and interested enough to download the app.

5.4.5. Key issues for communicating and disseminating the physical activity and sedentary behaviour guidelines for the early years

The results of this study suggest that multiple formats and dissemination channels would be necessary to reach and engage a wide-range of parents. Communication with parents should be supportive of parents' priorities and be presented in a non-judgemental or patronising manner. A summary of the key issues for communicating and disseminating the physical activity and sedentary behaviour guidelines for the early years resulting from this study are presented in Table 5.1.

Table 5.1. Key issues for communicating and disseminating the physical activity and sedentary behaviour guidelines for the early years

Communication of the Physical Activity Guidelines for Early Years to parents
Communication of the guidelines needs to be supportive and sensitive to the pressures of parenthood, using a positive, gain-framed approach Avoid authoritarian or controlling language
Communication of the guidelines should avoid being patronising or prescriptive. A sense of community or unity between parents is important to parents
Additional information to be included with the Physical Activity Guidelines for the Early Years
A clear and informative explanation of the physical activity and sedentary behaviour recommendations is necessary. This should include details of what counts as physical activity for preschool children, and an explanation of how the three-hour per day recommendation can be acquired in bouts throughout the day.
Parents would welcome ideas of play activities that can be carried out within the home that would count towards the physical activity recommendation for their preschool child. Ideas relevant to different developmental stages would be welcomed by parents.
Advice and ideas that are specific to parents' personal circumstances would be helpful to parents. For example, advice and play ideas for parents with a preschool child and a baby and families with no garden.
Providing advice on how parents can support their preschool child to play independently would be helpful for parents.

Parents preferred channels for dissemination of the Physical Activity Guidelines for the Early Years
Multiple channels should be used for disseminating the physical activity guidelines to parents to suit differing preferences.
The following channels were suggested as positive ways to receive the guidelines by parents: • From community settings, e.g. schools, children's centres and health visitors • Social media • Parenting websites (e.g. BabyCentre, Netmums, Mumsnet)
All channels used may benefit from using a community, local or peer support approach
Parents preferences for the format the Physical Activity Guidelines are received
Multiple formats should be used for disseminating the physical activity guidelines to parents to suit different preferences.
The following were suggested as positive formats to receive the physical activity guidelines: • Printed media (e.g. leaflet or booklet) • Online (through websites, social media, and viral video campaigns) • Digital mobile applications (apps) • Directly from a health professional

5.4.6. Strengths and limitations

This is the first study, to the researcher's knowledge, that has explored parents' preferences about how to communicate and disseminate physical activity guidelines for the early years to parents in the UK. As there is a lack of awareness from parents of the guidelines, improved promotion and dissemination of the guidelines is necessary. This study may help inform future dissemination activities.

This study benefited from having the opinions of parents from a wide variation in IMD areas, and a range of working and non-working parents. However, only one father took part in the focus groups, there was a low range of ethnic diversity (90% White British), and all parents resided in one area of the UK (Bristol), which may limit the extent to which data can be generalised to fathers, certain ethic groups and other parts of the UK.

5.4.7. Conclusions and future research

The findings from Study 1 suggested that mothers are not aware of the physical activity and sedentary behaviour guidelines for preschool children, and highlight the need for improved dissemination of guidelines to parents. This current study provides suggestions for the format parents would prefer to receive physical activity and sedentary behaviour guidelines, which included print and online media. Potential dissemination channels were discussed, and the findings suggest that several different channels may be necessary to account for different preferences.

This information may be useful for future dissemination efforts to parents. However, as with the previous chapter, it is not understood how well these findings represent the preferences of the wider population, including fathers, parents of different ethnicities and parents residing in different parts of the UK, and this warrants further investigation.

CHAPTER 6. PARENTS PREFERENCES FOR THE TERMINOLOGY, COMMUNICATION AND DISSEMINATION OF PHYSICAL ACTIVITY GUIDELINE INFORMATION FOR PRESCHOOL CHILDREN

6.1. Introduction

The previous chapters presented parents' perceptions of their preschool child's physical activity and sedentary behaviours and their views of the UK physical activity guidelines for the early years. The results provided several suggestions regarding how these guidelines could be improved. These included suggestions on the use of language and terminology, how to present physical activity intensity information, and suggestions on the communication and dissemination of physical activity guideline information for preschool children. Data from the qualitative studies were collected predominantly from White-British mothers residing in Bristol, UK. Thus, the aim of this study was to use an online survey to assess the acceptability of these suggestions with a larger and wider population group with an aim to include fathers, parents of different ethnicities, and parents residing in different regions within the UK.

6.2. Methods

Data were collected via an online survey made available through Online Surveys (www.onlinesurveys.ac.uk). The survey was open to participants for five weeks between March and May 2018. Participants were recruited though an advertisement (Appendix 13) posted on forums of various parenting websites (e.g. Netmums, Dadsnet,) and promoted through targeted Facebook groups such as regional parent and family groups. Parents, carers or guardians (collectively called parents from here on) of children aged between 2 until they commenced formal schooling (around 5 years) were invited to participate. Participants who completed the questionnaire had the option to enter a prize draw to win a £100 shopping voucher. Participation in the survey was anonymous and voluntary and participants were informed that by taking part in the survey they were consenting to take part in the study. The survey tool approximately 15 minutes to complete. Ethical approval for the study was obtained from the Facility of Health Sciences Research Ethics Committee at the University of Bristol (Ref: 63282).

The survey was designed to explore issues and opinions raised in the focus groups in the previous study with a larger and more diverse sample of participants and the implications for dissemination of national guidelines. Participants were asked to report demographic details such as their gender, age group, employment status and ethnicity. Questions relating to their preschool child included their gender, age, and if they had any physical or mental health conditions that may affect them taking part in physical activity. Participants home postcode was also obtained in order to calculate IMD quintiles using the University of Oxford's online IMD calculator[144]. Participants were asked if they felt their preschool child achieved the UK physical activity guidelines of

three hours per day (*Never, rarely, some days, most days, every day, don't know)*. In the next section of the survey, participants were asked to report how acceptable they found the four physical activity terms and descriptions (Still, Pottering, On the Go, and Huff and Puff) through Likert scale questions (e.g. Do you feel that Still is a suitable term for sedentary activity? *Yes, No, or Don't know*; What do you think about the description of Pottering for light intensity activity? *Not a very clear description, An adequate description, A very clear description*). Participants were asked if they had a suggestion of an alternative term for each of the intensity terms and were provided with a free text box in which they could add comments for each of the physical activity intensity terms. The survey provided a list of play activities for each physical activity intensity that had been generated through the nominal group technique group within Study 2 (Chapter 4), and participants were asked to select three activities that they felt gave an example of that intensity for their preschool child. The final part of the survey asked participants for their views on the format and dissemination of physical activity guideline information for preschool children through three questions, which gave answer options on a Likert scale: 1) How would you like to hear about physical activity information for your preschool child? 2) What information would you find useful? 3) Where would be a good place for you to receive physical activity information for your preschool child? At the end of the survey, a free-text box was provided for participants to comment on the survey or the subject. The full survey, with response options, can be found in (Appendix 14). Table 6.1 presents the terms and descriptions of physical activity intensities as they were presented to participants in the online survey.

Table 6.1 Terms and definitions of physical activity intensities presented in the online survey

Sedentary activity	**Still** activities are carried out sitting or lying, with little or no movement
Light intensity activity	**Pottering** involves slow easy movements or standing play
Moderate intensity activity	**On the Go** is energetic play that make children warm and breath faster but still able to talk
Vigorous intensity activity	**Huff and Puff** is high energy play that makes children feel hot and breath hard and fast

6.2.1. Data reduction

As there were few participants that had an ethnicity other than White-British (N = 44, 9%), ethnicity was collapsed down into White-British or Non-White-British to assess differences between groups.

6.2.2. Statistical analyses

Descriptive statistics (number and percent) for each question were calculated and tabulated. Differences between groups were calculated using Pearson's Chi-Square test. Where assumptions for this test were not met, i.e. when more than 20% of the expected counts are less than 5, met the likelihood ratio test was used. Spearman correlations were used to assess the strength and direction of an association between ranked variables.

6.3. Results

The online survey received 487 responses between March and May 2018. Figure.6.1 illustrates the distribution of responses across the UK. Most participants were from England (92.8%, *n* 451). The participant demographics are shown in Table.6.2. The frequencies and percentages to all survey questions are presented below. Full cross-tabulation of Chi-square results can be found in appendix 15.

Figure.6.1. Locations of survey responses

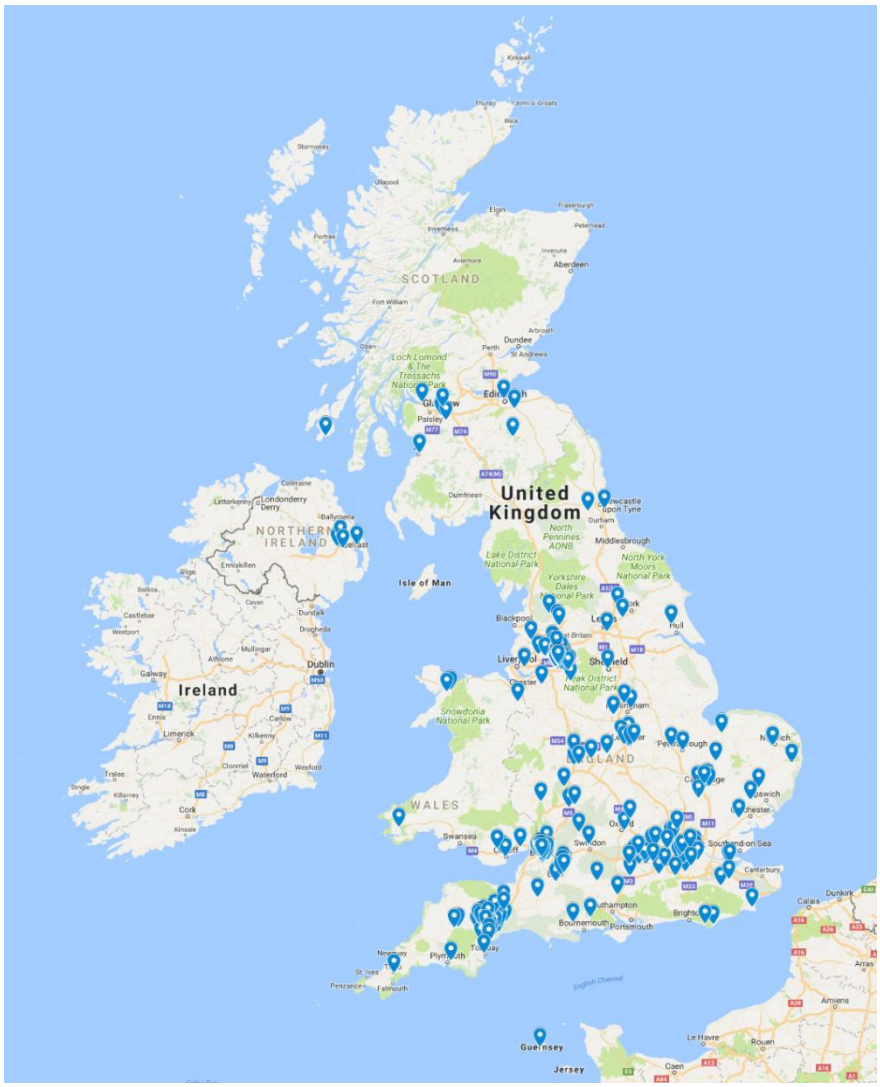


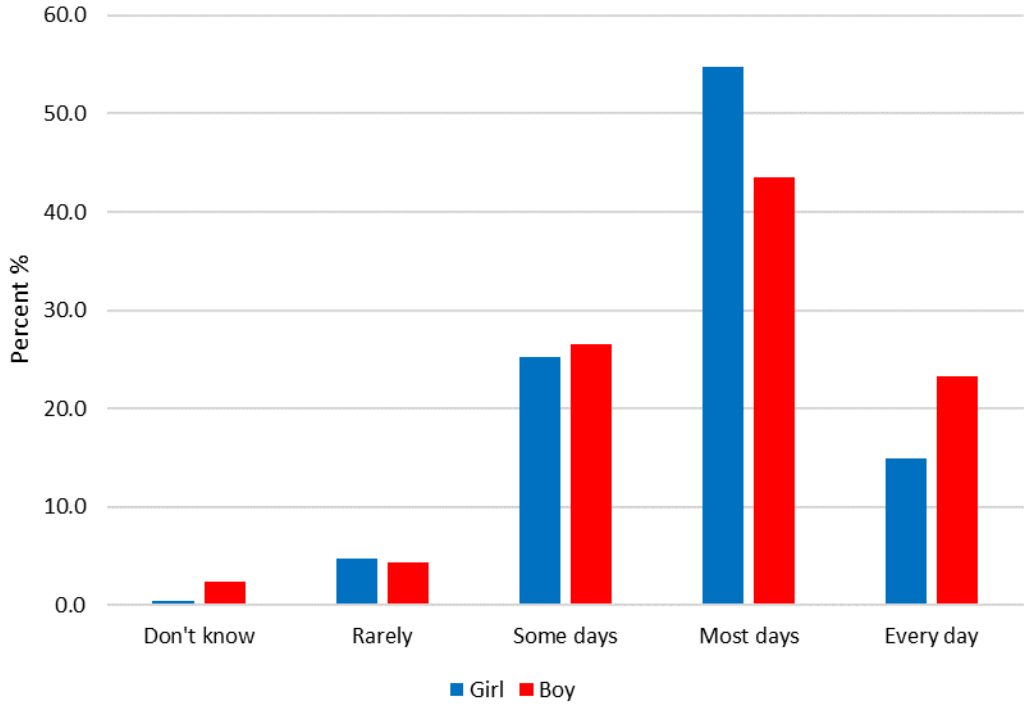
Table.6.2 Participant demographics

		All		Mothers		Fathers	
		N	%	N	%	N	%
	Total participants	487	100	440	90.3	47	9.7
Participant age (years)	18-25	9	1.8	7	1.6	2	4.2
	26-35	203	41.6	188	42.7	6	12.7
	36-45	262	53.8	233	53	25	61.7
	46-55	13	2.7	12	2.7	1	2.1
IMD Quintile	1st	148	30.4	131	29.8	17	36.2
	2nd	118	24.2	112	25.5	6	12.8
	3rd	67	13.8	60	13.6	7	14.9
	4th	53	10.9	50	11.4	3	6.4
	5th	47	9.7	40	9.1	7	14.9
Participant employment status	Working full-time	114	23.4	80	18.2	34	72.3
	Working part-time	244	50.1	235	53.4	9	19.1
	Full-time caregiver / maternity leave	114	23.4	112	25.4	2	4.2
	Student	9	1.8	7	1.6	2	4.3
	Not currently employed	6	1.2	6	1.4	0	0

Highest education in the household	GCSE / GNVQ or equivalent	17	3.5	16	3.6	1	2.1
	A levels / advanced GNVQ or equivalent	47	9.7	44	10	3	6.4
	Apprenticeship or vocational related qualifications	16	3.3	13	2.9	3	6.4
	Degree (BA, BSc) or professional qualifications	223	45.8	199	45.3	24	51
	Postgraduate degree or higher (MA, MSc, PhD, PGCE)	184	37.8	168	38.2	16	34
Participant ethnic origin	White British	443	91	404	91.8	39	83
	White Any other background	27	5.6	24	5.5	3	6.4
	Mixed / Multiple ethnic groups	7	1.4	5	1.1	2	4.2
	Asian / Asian British	9	1.6	7	1.6	1	2.1
	Black / British Black Caribbean	2	0.4	0	0	2	4.3
Single parent		33	6.8	31	7	2	4.3
Preschool child age	2 Years	144	29.6	132	30	12	25.5
	3 Years	178	36.6	161	36.6	17	36.2
	4 Years	128	26.3	112	25.5	16	34
	5 Years	37	7.6	35	8	2	4.3
Preschool child sex	Girl	234	48	214	48.6	20	42.6
	Boy	253	52	226	51.4	27	57.2

Nearly half of participants (48.9%) felt that their preschool child achieves 180 minutes of physical activity on most days. A difference was identified between responses from parents of boys and girls (χ^2 10.844, P = 0.028) (Figure 6.2). More parents of girls said that their child achieved three hours of physical activity on most days than parents of boys (54.7% Vs 43.5%) and more parents of boys said that their child achieved 3 hours of physical activity every day (15% Vs 23.3%). Single parents responded differently to co-habiting parents (χ^2 11.016, P = 0.026), with 15.2% of single parents reporting that their child rarely achieved three hours of physical activity per day compared to 3.7% of co-habiting parents.

Figure 6.2 Do you feel that your preschool child achieves the 3 hours of physical activity per day guidelines?



6.3.1. Responses to the terms and descriptions of physical activity intensities

Overall, participants responsed positively to the proposed terms and descriptions for physical activity intensities, with over 80% of participants responding ‘Yes’ to whether they felt the term suitable and over 90% of participants reponding that the descriptions were either ‘very clear’ or ‘adequate’. No differences were found between nations (England, Northern Ireland, Scotland, and Wales), however caution is needed when interpreting these results owing to the small number of participants from nations other than England. Figure 6.3 summarises the responses for the suitability of the activity intensity terms and Figure 6.4 summarises the acceptability of their descriptions.

Figure 6.3. Do you feel the following terms are suitable for their intensity level? Still, Pottering, On the Go, and Huff and Puff

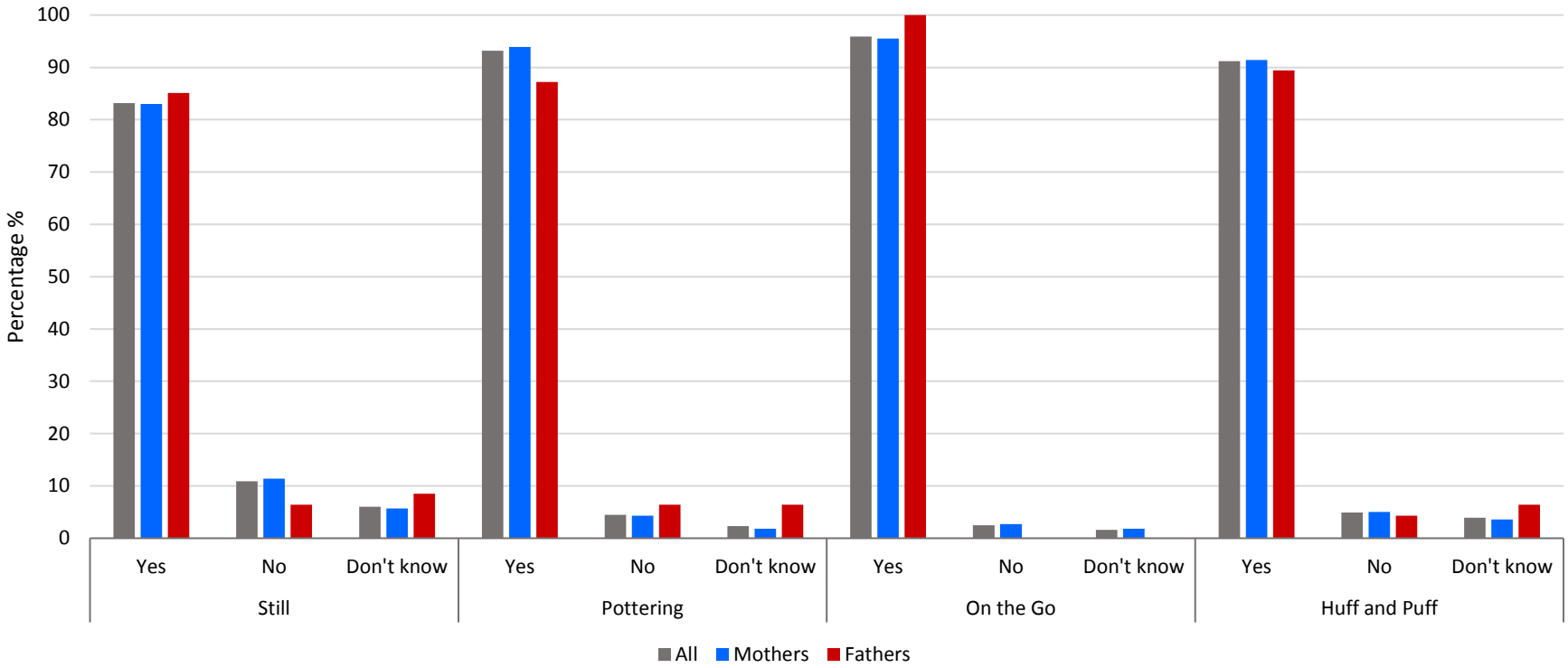
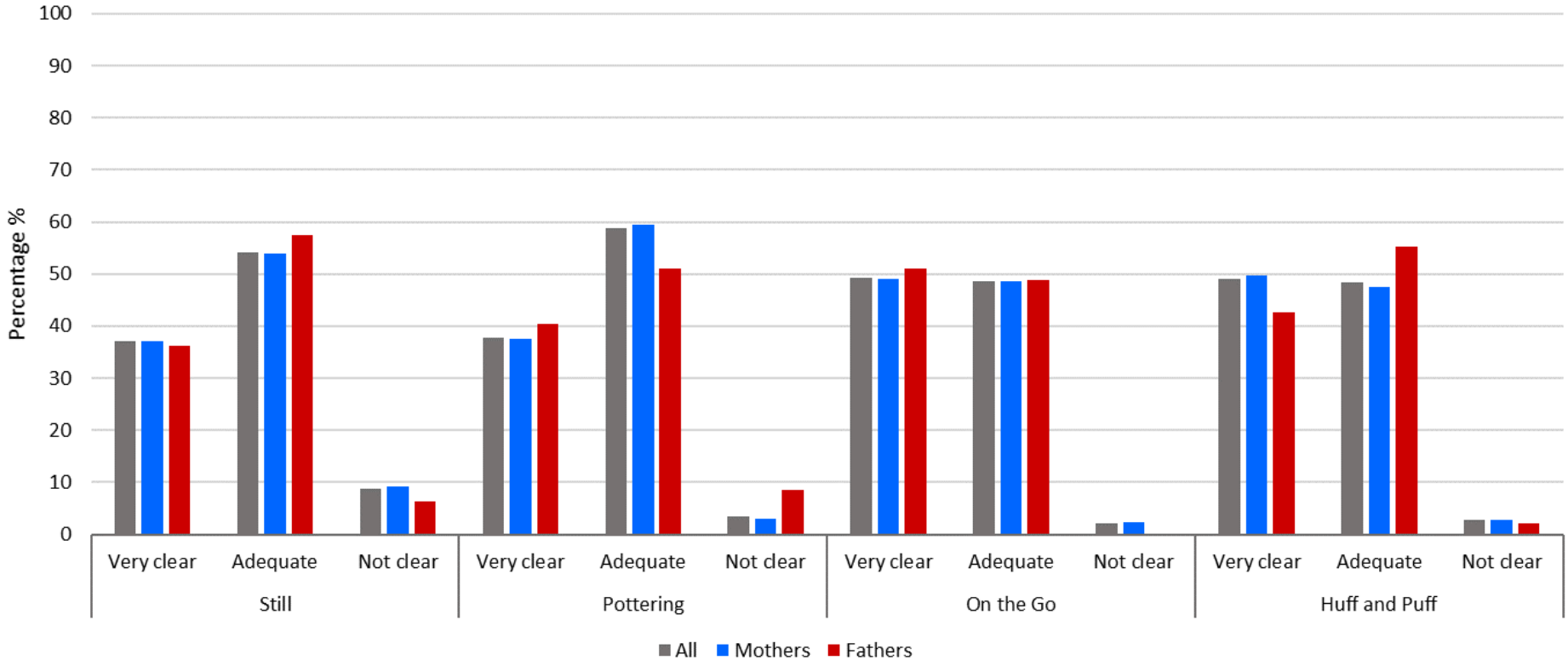


Figure 6.4. What do you think of the description of: Still, Pottering, On the Go, and Huff and Puff?



Still

The term Still was felt to be suitable for sedentary activity by 83.3% of participants (Table.6.3). A small number (8.8%) of participants felt that the description for Still was not clear. There were no differences between participant gender of how participants responded. However, differences of responses between household education category were observed (χ^2 23.783, P = 0.022). Participants with a lower level of education responded '*don't know'* more frequently than higher education levels (23.5% Vs 0 – 6.7% for higher education categories). The response option 'Yes' was similar across education groups (76.5- 86.7%) (Appendix 15).

Table.6.3 Reponses to questions on the term and description for Still by participant gender

		All		Mothers		Fathers	
		N	%	N	%	N	%
Do you feel that 'Still' is a suitable term for sedentary activity?	Yes	405	83.3	365	83	40	85.1
	No	53	10.9	50	11.4	3	6.4
	Don't know	29	6	25	5.7	4	8.5
What do you think of the description of 'Still'?	A very clear description	180	37	163	37	17	36.2
	An adequate description	264	54.2	237	53.9	27	57.4
	Not a clear description	43	8.8	40	9.1	3	6.4

Comments were received by 51 participants that felt Still was not a suitable term. Some participants felt that the term Still implied that there was no movement at all which is not necessarily true of a sedentary activity (N 24). Sixteen participants commented that they felt that their preschool child was never still. Other comments related to

participants' opinions on sedentary behaviour in children or how they interpreted the term Still. Eighteen alternative terms to Still were suggested by participants, these are presented in Table 6.4.

Table 6.4. Participants suggestions of alternative terms to Still

Alternative suggestion	N		
Quiet	19	Low energy	3
Sedentary	18	Slow	2
Calm	12	Immobile	1
Inactive	11	Gentle	1
Stationary / static	9	Low impact	1
Relaxed	7	Non-physical	1
Low / minimal movement	7	Limited	1
Resting	7	Down-time	1
Sitting	6	Engaged	1

The top three Still activities chosen by participants were reading (61.4%), watching television (47.2%) and drawing (37%). Activities that were chosen by at least one participant are presented in Table 6.5.

Table 6.5. Activities that participants feel would be an example of Still for their preschool child

	Still activities		
		N	%
1	Reading	299	61.4
2	Watching television	232	47.2
3	Drawing	180	37
4	Tablet / phone	148	30.4
5	Board games	115	23.6
6	Jigsaws	113	23.2
7	Construction	112	23
8	Audio books	81	16.6
9	Small world play	56	5.3
10	Stickers	51	10.5
11	Crafts	27	5.5
12	Cooking	16	3.3
13	Singing	7	1.4
14	Role play	6	1.2
15	Messy play	5	1
16	Sand and water play	4	0.8
17	Dressing up	3	0.6
18	Playing with a dog	3	0.6
19	Playing in the garden	2	0.4
20	Bubbles and balloons	2	0.4
21	Helping around the house	1	0.2
22	Hide and seek	1	0.2
23	Dens	1	0.2
24	Playing on the furniture	1	0.2

Pottering

The majority (93.2%) of participants felt that Pottering was a suitable term for light intensity activity and 96.5% felt that the description for Pottering was acceptable (37% responded ‘a very clear description’, 54.2% responded ‘an adequate description’) (Table.6.6). There was evidence of a negative correlation between the child’s age and participants’ response to the description for Pottering (*r* -.108, P .017), where participants with younger children found the description of Pottering more acceptable. A higher percentage of participants that identified themselves as non-White British responded, ‘*don’t know’* to the question “Is Pottering a suitable term for light intensity activity?” (χ^2 = 6.388, P = 0.041).

Table.6.6. Reponses to questions on the term and description for Pottering by participant gender

		All		Mothers		Fathers	
		N	%	N	%	N	%
Do you feel that 'Pottering' is a suitable term for light intensity activity?	Yes	454	93.2	413	93.9	41	87.2
	No	22	4.5	19	4.3	3	6.4
	Don't know	11	2.3	8	1.8	3	6.4
What do you think of the description of 'Pottering'?	A very clear description	184	37.8	165	37.5	19	40.4
	An adequate description	286	58.7	262	59.5	24	51.1
	Not a clear description	17	3.5	13	3	4	8.5

Pottering received comments from nineteen participants that felt it was not a suitable term for light intensity activity. Eight participants commented that they felt this term was better suited for adults than children. Five felt that pottering implies that the child is not engaged in the activity they are carrying out. Other comments included that the term is anglicised, not specific enough or that it is not a positive term. Twelve alternatives were given by participants for the term pottering. These are presented in Table 6.7.

Table 6.7. Participants suggestions of alternative terms to Pottering

Alternative suggestion	N
Light / low intensity	6
Gentle	5
Slow	3
Calm	2
Steady	1
Ambling	1
Dawdle	1
Standing	1
Toddle	1
Small play	1
Easy play	1
Unhurried	1

The top three activities chosen by participants as an example of Pottering for their preschool child were cooking (33.7%), helping around the house (33.7%) and small-world play (31.4%). Activities that were chosen by at least one participant are shown in Table.6.8.

Table.6.8. Activities that participants feel would be an example of Pottering for their preschool child

Pottering activities			
		N	%
1	Cooking	164	33.7
2	Helping around the house	164	33.7
3	Small world play	153	31.4
4	Construction	126	25.9
5	Dressing up	115	23.6
6	Sand and water play	96	19.7
7	Role play	79	16.2
8	Jigsaws	67	13.8
9	Dens	63	12.9
10	Crafts	53	10.9
11	Singing	49	10.1
12	Board games	44	9
13	Bubbles and balloons	40	8.2
14	Hide and seek	37	7.8
15	Messy play	28	5.7
16	Making music	26	5.3
17	Playing in the garden	23	4.7
18	Stickers	19	3.9
19	Playing on the furniture	12	2.5
20	Playing with a dog	8	1.6
21	Treasure hunt	5	1
22	Drawing	4	0.8
23	Reading	4	0.8
24	Rough and tumble	3	0.6
25	Tablet / phone	3	0.6
26	Audio books	2	0.4
27	Scooting	2	0.4
28	Obstacle courses	1	0.2
29	Watching television	1	0.2

On the Go

On the Go was felt to be a suitable term for moderate intensity physical activity for 95.9% of the participants (Table.6.9). All fathers (100%) felt that it was a suitable term. Differences between responses to whether the description for On the Go was adequate were observed between IMD quintiles (χ^2 18.625, P = 0.017), however there was no evidence of a correlation between participants IMD status and their response to this item (r = 0.028, P = 0.533). A greater percentage of participants that identified themselves as non-White British felt that the description for 'On the Go' was not adequate (6.8% vs 1.6%) and there was evidence of a difference of responses between participants that identified as non-White British compared to those that were White-British (χ^2 = 7.647, P = 0.022).

Table.6.9 Reponses to questions on the term and description for On the Go by participant gender

		All		Mothers		Fathers	
		N	%	N	%	N	%
Do you feel that 'On the Go' is a suitable term for light intensity activity?	Yes	467	95.9	420	95.5	47	100
	No	12	2.5	12	2.7	0	0
	Don't know	8	1.6	8	1.8	0	0
What do you think of the description of 'On the Go'?	A very clear description	240	49.3	216	49.1	24	51.1
	An adequate description	237	48.7	214	48.6	23	48.9
	Not a clear description	10	2.1	10	2.3	0	0

Eight participants provided a comment about the term On the Go. Five felt it implied continuous movement, one felt that it implied a higher intensity than moderate, one felt that it may mean different things to different people, and one felt that it was not specific enough. Some participants provided an alternative term to On the Go, which are presented in Table 6.10.

Table 6.10. Participants suggestions of alternative terms to On the Go

Alternative suggestion	N
Active Play	9
Busy	8
Energetic	5
Being lively	2
Go with the flow	1
Fast	1
Moving	1
Physically active	1
Slightly breathless	1
Steady	1
Playful	1

The top three activities chosen by participants as an example of On the Go for their preschool child were playing in the garden 49.1%, dancing 35.3%, and hide and seek 33.3%. Activities that were chosen by at least one participant are presented in Table.6.11.

Table.6.11. Activities that participants feel would be an example of On the Go for their preschool child

On the Go activities			
		N	**%**
1	Playing in the garden	239	49.1
2	Dancing	172	35.3
3	Hide and seek	162	33.3
4	Playing on the furniture	109	22.4
5	Rough and tumble	102	20.9
6	Scooting	86	17.7
7	Helping around the house	84	17.2
8	Bubbles and balloons	79	16.2
9	Dens	65	13.3
10	Obstacle courses	62	12.7
11	Running	50	10.3
12	Treasure hunt	44	9
13	Playing with a dog	36	7.4
14	Role play	36	7.4
15	Dressing up	27	5.5
16	Trampolining	21	4.3
17	Sand and water play	20	4.1
18	Singing	20	4.1
19	Cooking	12	2.5
20	Making music	11	2.3
21	Messy play	10	2.1
22	Construction	6	1.2
23	Small world play	2	0.4
24	Crafts	1	0.2
25	Drawing	1	0.2
26	Jigsaws	1	0.2

6.3.2. Huff and Puff

Most participants (91.2%) responded ‘Yes’ to if they felt that Huff and Puff was a suitable term for vigorous intensity activity. Just 2.7% of participants felt that the description for Huff and Puff was unclear. No significant differences were found between groups for Huff and Puff as a term or its description.

Table.6.12. Reponses to questions on the term and description for Huff and Puff by participant gender

		All		Mothers		Fathers	
		N	%	N	%	N	%
Do you feel that 'Pottering' is a suitable term for light intensity activity?	Yes	444	91.2	402	91.4	42	89.4
	No	24	4.9	22	5	2	4.3
	Don't know	19	3.9	16	3.6	3	6.4
What do you think of the description of 'Pottering'?	A very clear description	239	49.1	219	49.8	20	42.6
	An adequate description	235	48.3	209	47.5	26	55.3
	Not a clear description	13	2.7	12	2.7	1	2.1

Comments were received on the term Huff and Puff by 25 participants. Five participants felt that Huff and Puff sounded like the child is having a tantrum or negative behaviour, two felt that it implies a lack of fitness, and two were unsure of the meaning. Other comments included that they didn’t feel their child reached this intensity, that it felt childish, and the term was too informal.

Seven alternatives were given by participants for the term Huff and Puff (Table 6.13).

Table 6.13. Participants suggestions of alternative terms to Huff and Puff

Alternative suggestion	N
Energetic / high energy	14
Vigorous activity / play	7
Breathless / out of breath	3
Full steam	1
Full throttle	1
Fast paced	1
Hard	1

The top three activities that participants chose as examples of Huff and Puff for their preschool child were running (72.9%), trampolining (51.5%), and scooting (46%). Activities that were chosen by at least one participant are presented in Table.6.14.

Table.6.14. Activities that participants feel would be an example of Huff and Puff for their preschool child

Huff & Puff activities			
		N	%
1	Running games	355	72.9
2	Trampolining	251	51.5
3	Scooting	224	46
4	Dancing	144	29.6
5	Obstacle courses	140	28.7
6	Rough and tumble	138	28.3
7	Playing in the garden	83	17
8	Playing on the furniture	66	13.6
9	Playing with a dog	17	3.5
10	Hide and seek	14	2.9
11	Singing	3	0.6
12	Dens	2	0.4
13	Bubbles and balloons	2	0.4
14	Helping around the house	1	0.2
15	Messy play	1	0.2
16	Role play	1	0.2
17	Sand and water play	1	0.2
18	Treasure hunt	1	0.2
19	Tablet / phone	1	0.2

6.3.3. What additional information would participants find useful

Advice on how to know if your child is getting enough physical activity received the most positive responses, with 94.3% of participants responding either ‘Useful’ or ‘Very Useful’, followed closly by information on activities and what’s on in your local area, which received 94% positive comments. The least favoured option was a forum where you can share ideas with other parents, for which 34.7% of people responded either ‘Not very useful’ or ‘Not at all useful’ (Table 6.15).

There were differences in responses between participant gender. A higher percentage of male participants responded that they would not find information on what counts as physical activity useful than female participants (19.1% Vs 3.6%, χ^2 8.401, P = 0.038). Male participants also felt that information on how to help their preschool child to be more active would be not at all useful than female participants (2% Vs 21.3%, χ^2 = 11.652, P = 0.009). A difference in responses was found for participants age and how useful they would find information and examples of what counts as physical activity (χ^2 = 30.679, P = 0.031) and tailored advice or ideas specific to their situation (χ^2 = 36.24, P = 0.007). However there were very few participants within the 18-25 (N = 9) age category, and when this was removed from analyses, these were no longer significant (P >0.05). A difference was also observed between parents of boys and girls for how useful advice on knowing if your child is getting enough physical activity (χ^2 = 9.014 P = 0.029).

Key: Answer options for 'What information would you find useful?'

A: Information and examples of what counts as physical activity

B: Advice on how to know if your child is getting enough physical activity

C: Advice on how to help your child be more active

D: Ideas of play activities to do at home

E: Tailored advice or ideas specific to your situation

F: Information on activities and what's on in your local area

G: A forum where you can share ideas with other parents

Figure 6.5 What information would you find useful?

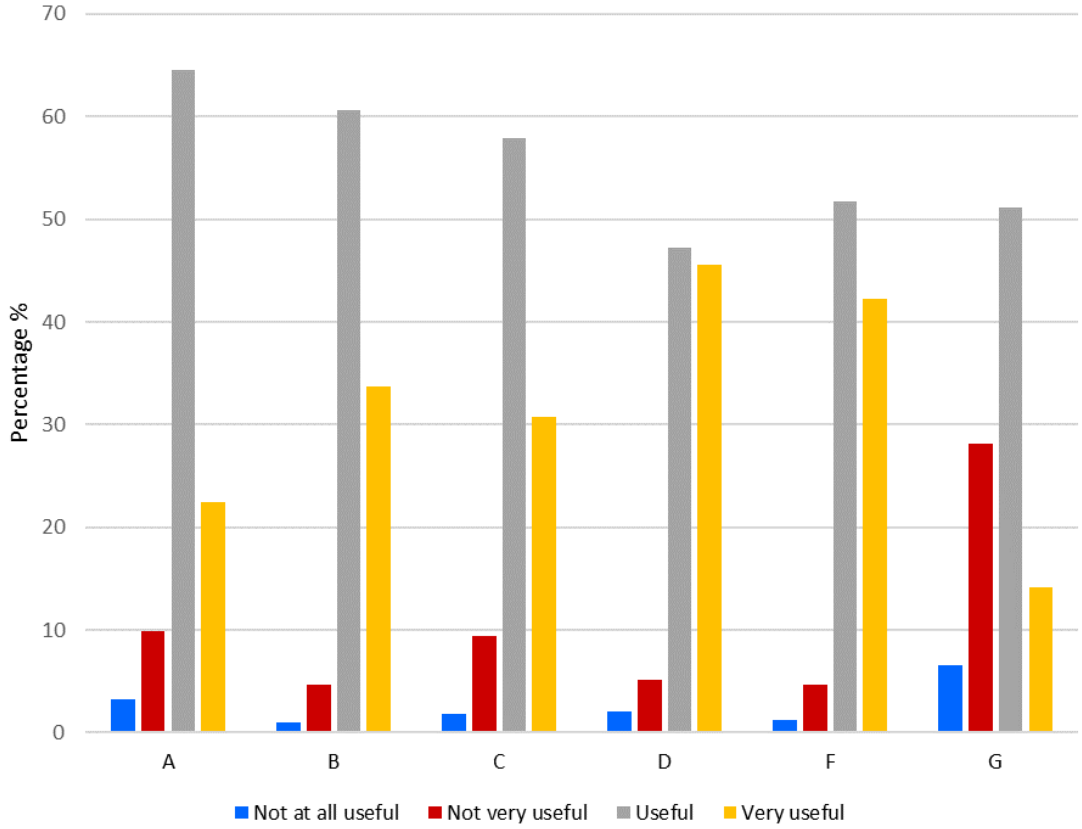


Table 6.15. What information would you find useful?

		All		Mothers		Fathers	
		N	%	N	%	N	%
A	Not at all useful	16	3.3	16	3.6	0	0.0
	Not very useful	48	9.9	39	8.9	9	19.1
	Useful	314	64.5	283	64.3	31	66.0
	Very useful	109	22.4	102	23.2	7	14.9
B	Not at all useful	5	1.0	5	1.1	0	0.0
	Not very useful	23	4.7	21	4.8	2	4.3
	Useful	295	60.6	270	61.4	25	53.2
	Very useful	164	33.7	144	32.7	20	42.6
C	Not at all useful	9	1.8	9	2.0	0	0.0
	Not very useful	46	9.4	36	8.2	10	21.3
	Useful	282	57.9	263	59.8	19	40.4
	Very useful	150	30.8	132	30.0	18	38.3
D	Not at all useful	10	2.1	9	2.0	1	2.1
	Not very useful	25	5.1	22	5.0	3	6.4
	Useful	230	47.2	207	47.0	23	48.9
	Very useful	222	45.6	202	45.9	20	42.6
E	Not at all useful	14	2.9	14	3.2	0	0.0
	Not very useful	62	12.7	54	12.3	8	17.0
	Useful	246	50.5	220	50.0	26	55.3
	Very useful	165	33.9	152	34.5	13	27.7
F	Not at all useful	6	1.2	4	0.9	2	4.3
	Not very useful	23	4.7	20	4.5	3	6.4
	Useful	252	51.7	225	51.1	27	57.4
	Very useful	206	42.3	191	43.4	15	31.9
G	Not at all useful	32	6.6	26	5.9	6	12.8
	Not very useful	137	28.1	124	28.2	13	27.7
	Useful	249	51.1	225	51.1	24	51.1
	Very useful	69	14.2	65	14.8	4	8.5

6.3.4. Parents preferred format for physical activity and sedentary behaviour guidelines

Information presented on an existing website (e.g. NHS or Netmums) and a dedicated website were participants most favoured formats to receive physical activity information, with 72.7% and 70% respectively of participants responding 'Good' or 'Very Good' to these options. A personalised live question and answer session was the least favoured with 36.7% of participants responding 'Bad' to this option (Table 6.16).

There was a difference in response to receiving information via a video or podcast between participant age categories (χ^2 = 32.638 P = 0.05), however there was no evidence of a correlation between these variables (r = 0.039 P = 0.395). A smaller proportion of participants that were working (full or part-time) responded that receiving information through a printed leaflet or booklet would be 'good' or 'very good' than participants who were on maternity leave, were full-time carers, or were not currently employed (χ^2 = 25.224 P = 0.047). A difference in responses was found between education category and responses to receiving information via an online question and answer session (χ^2 = 36.525 P = 0.006) or from a mobile app (χ^2 = 30.884 P = 0.03). No correlation was found for increasing education and responses to these items.

Key: Answer options for 'What format would be a good way for you to receive physical activity information for your preschool child?'

A: Print – a leaflet or booklet

B: Online – an information page on a pre-existing website (e.g. NHS, Netmums)

C: Online – a dedicated website

D: Online – a short video or podcast

E: Online – a personalised live question and answer session (Chatbot)

F: Mobile App – an interactive app for mobiles and tablets

Figure 6.6. What format would be a good way for you to receive physical activity information for your preschool child?

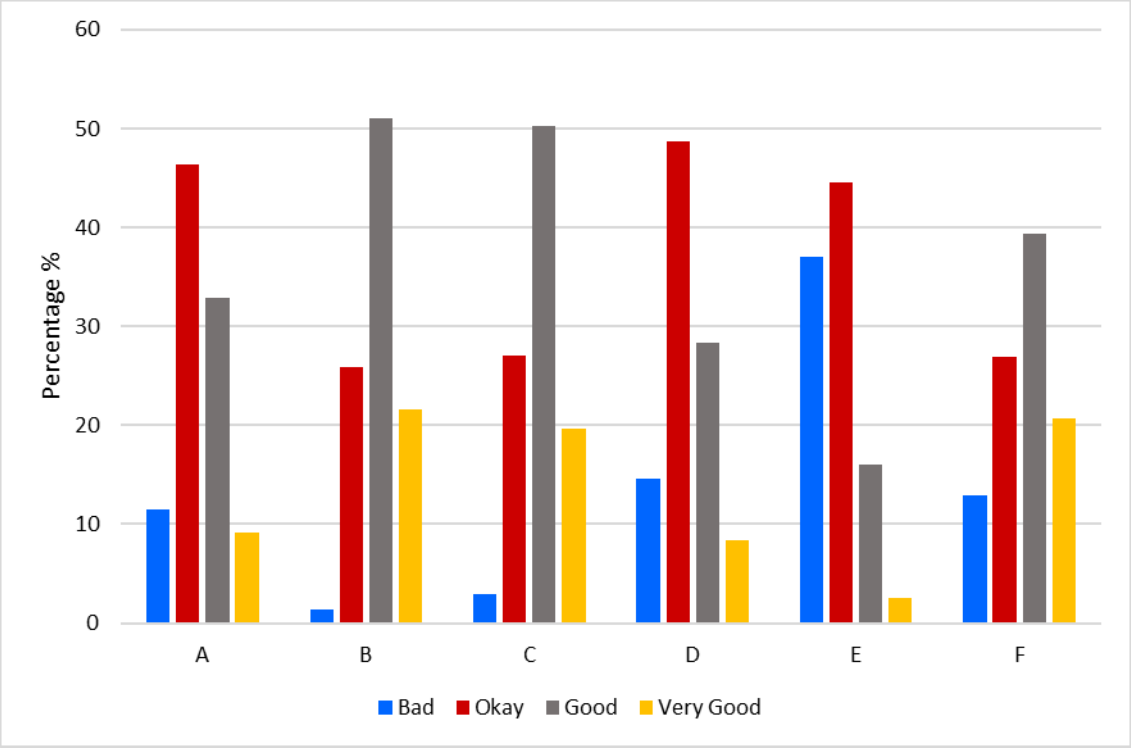


Table 6.16. What format would be a good way for you to receive physical activity information for your preschool child?

		All		Mothers		Fathers	
		N	%	N	%	N	%
A	Bad	56	11.5	48	10.9	8	17.0
	Okay	226	46.4	101	45.9	24	51.1
	Good	160	32.9	147	33.4	13	27.7
	Very Good	45	9.2	43	9.8	2	4.3
B	Bad	7	1.4	5	1.1	2	4.3
	Okay	126	25.9	116	26.4	10	21.3
	Good	249	51.1	223	50.7	26	55.3
	Very Good	105	21.6	96	21.8	9	19.1
C	Bad	14	2.9	12	2.7	2	4.3
	Okay	132	27.1	124	28.2	8	17.0
	Good	245	50.3	216	49.1	29	61.7
	Very Good	96	19.7	88	20.0	8	17.0
D	Bad	71	14.6	68	15.5	3	6.4
	Okay	237	48.7	48.2	48.2	25	53.2
	Good	138	28.3	28.4	28.4	13	27.7
	Very Good	41	8.4	8	8.0	6	12.8
E	Bad	180	37.0	162	36.8	18	38.3
	Okay	217	44.6	196	44.6	21	44.7
	Good	78	16.0	70	15.9	8	17.0
	Very Good	12	2.5	12	2.7	0	0.0
F	Bad	63	12.9	55	12.5	8	17.0
	Okay	131	26.9	120	27.3	11	23.4
	Good	192	39.4	175	39.8	17	36.2
	Very Good	101	20.7	90	20.5	11	23.4

6.3.5. Parents preferred dissemination channels

The most favoured option for where to receive physical activity information was from a preschool or nursery, with 88.5% of participants responding 'Good' or 'Very good'. The least favoured option was receiving information from an ante-natal class, which 37.5% of participants responded 'Bad', followed by and advert in a local or national newspaper which 33.3% of participants responded 'Bad' (Table 6.17).

There were differences in responses dependant on the child's age to receiving information from ante-natal classes or preschool/nursery. However, there was no correlation between child's age and these responses. Where participants felt would be a good place to receive physical activity information from differed according to the highest education level within the household. The following sources of information had different responses between education level: health professionals (χ^2 = 36.599 P = 0.006), preschools or nurseries (χ^2 = 32.703 P = 0.018), parent groups (χ^2 = 38.353 P = 0.003), online advertising (χ^2 = 29.312 P = 0.045) social-media (χ^2 = 33.61 P = 0.014), parenting websites (χ^2 = 34.425 P = 0.011), blogs or vlogs (χ^2 = 42.866 P = 0.001) emails (χ^2 = 33.477 P = 0.015) and press advertising (χ^2 = 33.697 P = 0.014).

There were differences in the responses between IMD status quintiles for receiving information from a health professional (χ^2 = 36.559 P = 0.006), ante-natal class (χ^2 = 24.933 P = 0.015) and press advertising (χ^2 23.965 P = 21.381). A positive correlation was observed between increasing IMD status and preference of receiving information from a health professional (*r* = 0.141 P = 0.002) and an ante-natal class (*r* = 0.0012 P =

0.014) (participants from more deprived areas responded more positively to these sources than those from less deprived areas) but not for press advertising (r = 0.068 P = 0.134).

Key: Where would be a good place for you to receive physical activity information for your preschool child?

A: Health professional (e.g. health visitor, GP)

B: Ante-natal class

C: Preschool or nursery

D: Parent and child groups (e.g. stay and play, sing and sign)

E: Online advertising

F: Social media (e.g. Facebook, Twitter, Instagram)

G: Information pages on parenting websites (e.g. Netmums, The Dad Network)

H: A feature on parenting blogs or vlogs

I: An email to your personal email address

J: TV and radio advertising

K: Advert or feature in a local or national newspaper

L: Word of mouth / information shared between parents

Figure 6.7 Where would be a good place for you to receive physical activity information for your preschool child?

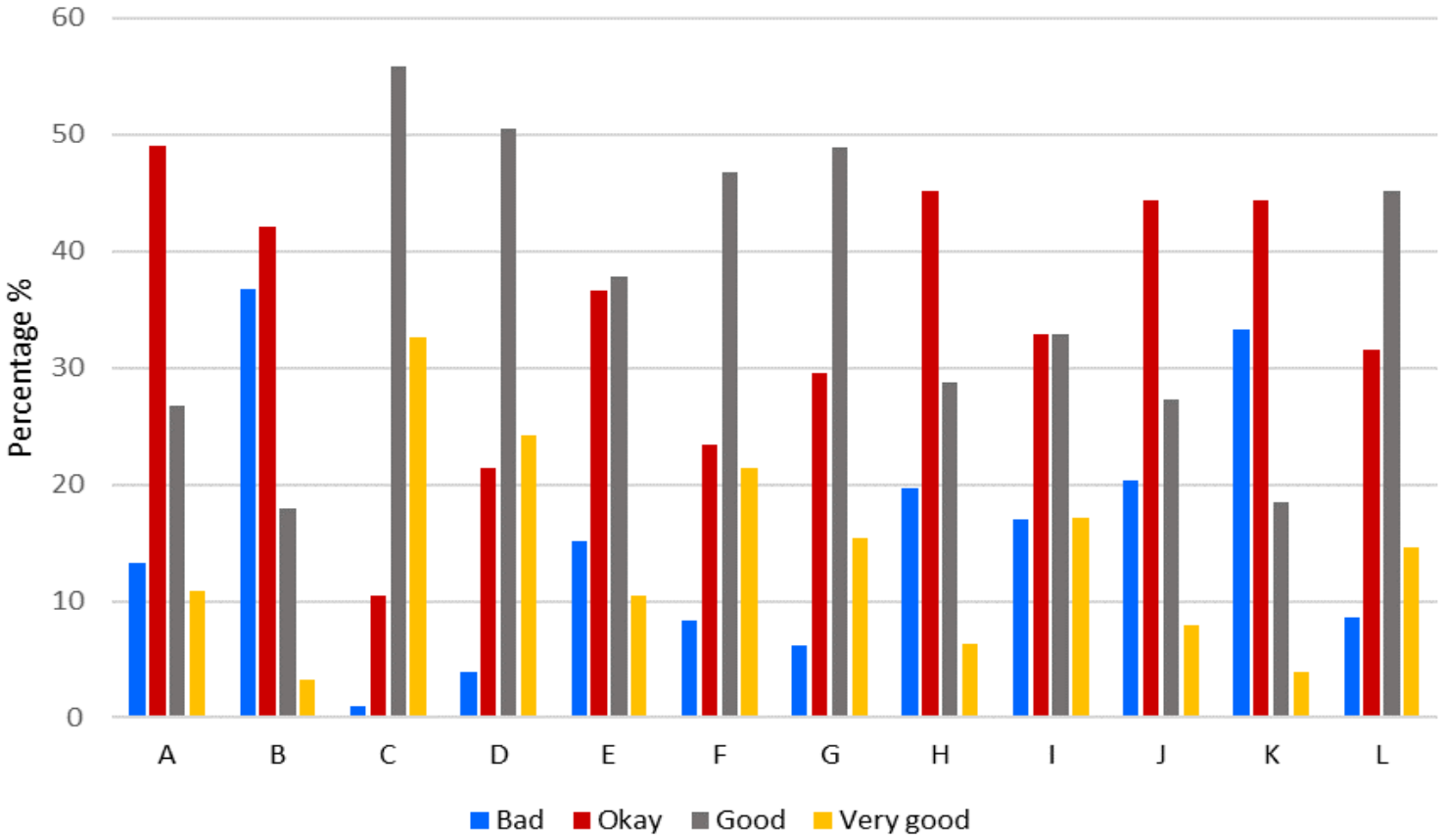


Table 6.17. Where would be a good place for you to receive physical activity information for your preschool child?

		All		Mothers		Fathers	
		N	%	N	%	N	%
A	Bad	65	13.3	59	13.4	6	12.8
	Okay	239	49.1	214	48.6	25	53.2
	Good	130	26.7	118	26.8	12	25.5
	Very Good	53	10.9	49	11.1	4	8.5
B	Bad	179	36.8	156	35.5	23	49.8
	Okay	205	42.1	190	43.2	15	31.9
	Good	87	17.9	81	18.4	6	12.8
	Very Good	16	3.3	13	3.0	3	6.4
C	Bad	5	1	4	0.9	1	2.1
	Okay	51	10.5	46	10.5	5	10.6
	Good	272	55.9	242	55.0	30	63.8
	Very Good	159	32.6	148	33.6	11	23.4
D	Bad	19	3.9	16	3.6	3	6.4
	Okay	104	21.4	92	20.9	12	25.5
	Good	246	50.5	222	50.5	24	51.1
	Very Good	118	24.2	110	25.0	8	17.0
E	Bad	74	15.2	63	14.3	11	23.4
	Okay	178	36.6	159	36.1	19	40.4
	Good	184	37.8	170	38.6	14	29.8
	Very Good	51	10.5	48	10.9	3	6.4
F	Bad	41	8.4	34	7.7	26	5.9
	Okay	114	23.4	102	23.2	129	29.3
	Good	228	46.8	205	46.6	214	48.6
	Very Good	104	21.4	99	22.5	71	16.1
G	Bad	30	6.2	26	5.9	4	8.5
	Okay	144	29.6	129	29.3	15	31.9
	Good	238	48.9	214	48.6	24	51.1
	Very Good	75	15.4	71	16.1	4	8.5

H	Bad	96	19.7	81	18.4	15	31.9
	Okay	220	45.2	201	45.7	19	40.4
	Good	140	28.7	128	29.1	12	25.5
	Very Good	31	6.4	30	6.8	1	2.1
I	Bad	83	17	77	17.5	6	12.8
	Okay	160	32.9	141	32.0	19	40.4
	Good	160	32.9	141	32.0	19	40.4
	Very Good	84	17.2	81	18.4	3	6.4
J	Bad	99	20.3	90	20.5	9	19.1
	Okay	216	44.4	194	44.1	22	26.8
	Good	133	27.3	120	27.3	13	27.7
	Very Good	39	8	36	8.2	3	6.4
K	Bad	162	33.3	152	34.5	10	21.3
	Okay	216	44.4	195	44.3	21	44.7
	Good	90	18.5	77	17.5	13	27.7
	Very Good	19	3.9	16	3.6	3	6.4
L	Bad	42	8.6	39	8.9	3	6.4
	Okay	154	31.6	138	31.4	16	34
	Good	220	45.2	196	44.5	24	51.1
	Very Good	71	14.6	67	15.2	4	8.5

6.3.6. Participant comments

At the end of the survey was an optional free-text box to add any comments about the subject or survey. Thirty-four people entered text into this box. The contents included eight comments about the survey itself (e.g. they found it easy to complete or they experienced difficulties), six comments provided participants opinions on how to help children be more physically active, and eight comments expressed an interest in the research and subject area. These comments were not analysed further as they had no relevance to the content of the survey questions.

6.4. Discussion

The data presented in this chapter provides evidence of good acceptability of the four physical activity terms and descriptions. Over 80% of participants responded 'yes' to whether they felt the terms were suitable and over 90% of participants reponded that the descriptions were either 'very good' or 'adequate'. These results support the findings from the qualitative study in which these terms were developed (Chapter 4), that parents felt that these terms were appropriate to help illustrate physical activity intensities in preschool children. Results were consistent across country (England, Northern Ireland, Scotland and Wales), IMD status, employment status and education level, providing evidence of acceptability across different demographics. There were no differences in responses from parents that identified themselves as White-British and those that did not, except for responses to the term pottering. A higher proportion of non-White-British participants reported 'don't know' to whether they found the term 'pottering' suitable for light intensity activity. As highlighted in the qualitative study presented in Chapter 4 and the comments provided from participants in this survey, this may be because the term Pottering is too

Anglicised or colloquial. The ethnicity variable was dichotomised into White-British and non-White-British and so there is no differentiation between ethnic subgroups or between participants that have English as a first or additional language, which may impact on how these terms are viewed. The sample size was small for non-White-British participants, and as such more information from a diverse set of participants would be helpful to understand this term

The term Still received the fewest positive responses ('Yes, it is a suitable term') and also generated the most free-text comments from participants. The comments suggested this partially was parent's perception that preschool children are in constant motion, which was also identified in the focus groups with parents in Study 2 (Chapter 4). This highlights the need for improved parental education around preschool children's sedentary behaviours.

'On the Go' was a term developed in the later stages of the focus groups presented in Chapter 4 and so little data was available for acceptability of this term before this study. The results from the survey show that this term is acceptable to describe moderate intensity physical activity with nearly all participants (95.9%) agreeing that it was a suitable term. The description for On the Go was viewed as 'not adequate' by more non-White-British participants than White-British. Nevertheless, most non-White-British participants (93%) still responded that the description was either 'very clear' or 'adequate'.

Most play activities selected by participants as examples of the physical activity intensities were comparable to those produced in the qualitative study. All but one of the top three activities summarised from the NGT study (Chapter 4) appeared in the top ten activities chosen by participants in this survey. There were discrepancies in some of the play activities chosen for each intensity, where some activities did not relate to the intensity intended (e.g. dressing up and playing in the garden were selected as examples for Still and playing on a tablet or phone was selected as an example of Huff and Puff). It may be that some participants did not understand what was required of them from this question, they did not interpret the terms in the way that was intended, or it was human error when completing the survey.

Preschools and nurseries received the most positive responses for dissemination channels with only 1% of parents responding that this would be a bad option for them. A survey of childcare centre directors, health professionals and parents found that there were no significant barriers to providing health information to parents from childcare centres and parents felt that receiving information in this way would improve their health knowledge and behaviours[172], further supporting that disseminating physical activity information via preschools and nurseries may be advantageous.

The use of social media (e.g. Facebook, Twitter) for health promotion is becoming increasingly commonplace[158 173] and was a favoured source of information for many participants in this study. This was consistent with previous research. For example, in a peer-led, child feeding education intervention, Facebook was found to be an optimal

medium for disseminating information to parents. Information could be shared amongst parent networks easily and quickly, and it provided continued engagement in the study[174]. Use of social media can be a cost-effective way to disseminate information that provides real-time communication with a casual tone[158], which would support the need for a less authoritative approach to receiving information as discussed in Chapter 5. It can be used to disseminate evidence-based information to a broad audience and increase signposting to credible sources[175]. In addition, social media interventions have been found to be effective promoting health equity in certain disadvantaged populations, such as those from low SES areas or ethnic minority groups [176]. Therefore, as there is little difference in social media use by ethnicity, sex, income, education or community type[173], it may be a positive way of effectively reaching hard to reach groups. However, the use social media does pose some challenges. For example, a difficulty is how to obtain and measure the quality of engagement from the target audience (i.e. whether it is meaningful engagement or just stopping by)[158]. In addition, participants in the focus groups of Study 2 (Chapter 5) were cautious of experiencing negative interactions by participating in social media content, so some control over these interactions may be necessary to ensure a safe online environment.

Receiving physical activity and sedentary behaviour guideline information online was the preferred format, either via an existing website (e.g. NHS or a parenting website) or a dedicated website. This was consistent across different demographic groups. The majority of internet users look online for health information and use search engines to find the information they require[170]. However, it has been reported that people are often not able to find the most current or accurate information available[170]. In addition, in an obesity

prevention study, although parents also approved of receiving information via a website, they were concerned over the reliability of the content[177]. Being directed to a particular website may be more useful than relying on parents to accurately search for information through a search engine[178]. This may also enhance the credibility of the information provided by directing parents to a trusted source (e.g. NHS or a familiar parenting website such as BabyCentre). As discussed in Chapter 5, the effectiveness of providing information online is reliant on parents actively looking for this information and so clear signposting and effective promotion may be necessary.

Chapter 5 and a qualitative study by Carson *et al*. in Canada[124] reported that mothers would welcome receiving physical activity guideline information during pregnancy or early on during motherhood. However, this study found that parents did not advocate receiving information via an ante-natal class, indicating this channel of dissemination may not be advantageous. Television and press advertising has been shown to be successful in producing behaviour change in social marketing campaigns[179]. However, these methods of dissemination were also not rated highly by participants in this study, the reasons for this are unknown and may be worth investigating.

Most participants felt that it would useful to receive information on how to know if their child is getting enough physical activity, which may be reflective of parents' difficulty in estimating their child's physical activity (Chapter 3). Parents inaccuracy at assessing their child' s physical activity has been reported in a mixed-methods study utilising accelerometer data with parent interviews. The authors suggest that efforts are needed to

improve the accuracy of parents' perceptions of their child's physical activity. The majority of parents whose children did not meet the physical activity guidelines, made an inaccurate assessment of their child's activity levels[126]. Participants in this study appeared to welcome information on activities to do with their preschool child and activities that are on in the local area. Similarly, in a qualitative study in Canada, parents expressed a need for more specific ideas and strategies to help them meet the Canadian sedentary behaviour guidelines[124]. Providing ideas of play activities for preschool children may in turn encourage an increase in physical activity. Participants in this study did not respond positively about sharing information with other parents via an online forum. This contradicts the finding of the qualitative study where parents felt that this would be a very useful tool.

Although the results of this study suggest that targeted promotion of physical activity guideline information may not be necessary, there are some important considerations. Firstly, parents of boys appeared to feel their child reached the three hours of physical activity per day recommendation more frequently than parents of girls and felt that information on how to know if your child is getting enough physical activity less useful than parents of girls. Within the preschool years, boys and girls have been found to have similar levels of physical activity[180], however, parents tend to view boys as being more physically active[181]. These beliefs may negatively influence parents perceived need to increase physical activity opportunities for their sons. As mothers have identified a need for gender specific guidelines (chapter 3, [124]), it may be worthwhile to help parents of boys identify the need for an increase in physical activity.

This study showed some evidence that there may be differences between education level and responses to where would be a good place to receive physical activity information. This may warrant further investigation to see if varying education levels should be targeted via different channels. Another consideration is that a higher proportion of participants from an area of higher deprivation appeared to favour receiving information via a health professional or an antenatal class compared to participants from an area of lower deprivation. Direct communication from health professionals may be a useful approach to reach low income groups.

6.4.1. Key issues for communicating and disseminating physical activity guideline information for to parents

Table 6.18 provides a summary of the key implications resulting from this study.

Table 6.18. Key issues for communicating and disseminating the physical activity guidelines for the early years

Terminology to present physical activity intensities to parents

• The terms Still, Pottering, On the Go, and Huff and Puff are suitable terminology to use when presenting information on physical activity intensities to parents in the UK.
• Parents feel that the descriptions presented alongside these terms are adequate.
• The most frequent play activities chosen as examples of each physical activity intensity are:
  ○ Still: Reading, watching television, drawing, using a tablet or mobile phone, board games.
  ○ Pottering: Cooking or baking, helping around the house, small-world play, construction, dressing up.
  ○ On the Go: Playing in the garden, dancing, hide and seek, playing on the furniture, rough and tumble.
  ○ Huff and Puff: Running games, Trampolining, scooting, dancing, obstacle courses

Parents preferred channels for dissemination of the Physical Activity Guidelines for the Early years
Preschools and nurseries as sources of information were favoured by parents of all demographic groups.
Parent and child groups (e.g. Stay and Play), social media, information on parenting websites and word of mouth were other positive dissemination channels.
Ante-natal classes, television advertising, and advertisements in local or national newspapers were the least favoured options.
Parents from higher IMD areas may be receptive to receiving information directly from health professionals.
Parents preferences for the format the Physical Activity Guidelines for the Early Years are received
Receiving information online, either from and existing website or dedicated website was the preferred format. Mobile Apps were also seen as a good format by many parents.
Printed media was more acceptable to parents that were not currently working than those in employment.
Additional information to be included with the Physical Activity Guidelines for the Early Years
All the suggested items for additional information to supplement the guidelines were rated as useful by the majority of parents.
Ideas of play activities to do at home and information on activities that are on in the local area were the highest rated.
Tailored advice or ideas and a forum to share ideas with other parents were the lowest rated options.

6.4.2. Strengths and limitations

The major strength of this study is the provision of information on how best to communicate and disseminate the Physical Activity Guidelines for the Early years in a relatively large, nationwide, sample of parents of preschool children in the UK. This supports the results of the NGT and qualitative study presented in Chapters 4 and 5, that the proposed terms and definitions are deemed as suitable by parents of preschool children, and thus may be a useful way of helping parents gain a greater understanding and awareness of their preschool child's physical activity levels. To the researchers' knowledge, this is the first study that has explored parents' preferences about how to communicate and disseminate physical activity guideline information for the early years with a nationwide sample of parents in the UK. This information may help future dissemination initiatives. This study also provides analytical generalisability where a concept formed in initial research is confirmed with a differing population and methodology, which provides strength to the findings[160].

There are several limitations of this study that need to be considered. The survey was made available online and promoted through local and regional websites to get a representative sample of parents in the UK. Thus, parents that do not use social media or parenting websites will not be represented as these were the only locations of recruitment to this study. There were some groups that were under-represented in this sample. Most participants were from England and the other UK nations were not as well represented. Although no differences were found in responses between each of the nations, this may be important when considering whether the terms and descriptions proposed are suitable for

nationwide use because of difference in regional dialect. Although every effort was made to promote the survey to fathers, they were still under-represented in the survey, making up only 10% of the sample. Fathers are commonly underrepresented in family-focused physical activity research because of difficulties in recruiting them to take part in studies[182]. The sample was made up of 91% White-British participants, and so other ethnic groups may not be well represented in this group. In addition, it isn't possible to know how many participants had English as a second language, which may be an important consideration when thinking about the suitability of using the terms suggested. Single parents were also under-represented making up 6.8% of the total sample when in the UK 22% of families with dependent children are single parents[183]. The responses of single parents did not differ from co-habiting parents apart from a higher percentage of single parents felt that receiving tailored advice for their personal situation would be useful. Using an additional targeted approach to directly recruit these hard to reach groups (e.g. though contacting community groups) may have been beneficial to improve their representation within this study.

6.4.3. Conclusions and future research

This survey provided further evidence that the terms and descriptions for the four levels of physical activity intensity developed in Chapter 4 are acceptable to parents from different demographic backgrounds in the UK. As parents have found that understanding and interpreting physical activity intensity in preschool children problematic, these terms, along with the examples of play activities for each intensity provided here, illustrate physical activity intensities in a way that is useful and comprehensible. This in turn may help parents accurately interpret the physical activity guidelines for the early years.

Qualitative data showed that parents are not aware of the current physical activity guidelines for the early years indicating that improved dissemination is needed. Parents in this survey suggested ways which they feel would be favourable for them to receive guideline information and in what format. This information would be valuable for future health promotion and dissemination initiatives.

CHAPTER 7. DISCUSSION

This final chapter summarises and synthesises the main findings presented in this thesis and provides a discussion of the implications for physical activity and sedentary behaviour guidelines and policy, and future research. It ends by detailing the strengths and limitations of the thesis and overall conclusions.

7.1. Summary of thesis findings

The overall aim of this thesis was to explore how parents can be supported to increase their preschool child's physical activity and reduce their sedentary behaviours. This was addressed through answering two research questions:

> **Research Question 1:** How can parents be supported to help their preschool child achieve appropriate levels of physical activity and sedentary behaviour?
>
> **Research Question 2:** How can physical activity and sedentary behaviour guidelines be effectively presented and communicated to parents of preschool children?

The findings of the studies and how they relate to the two primary research questions are summarised here and put into context with the wider literature. The thesis map (Table 7.1) summarises the objectives and key outcomes from each study.

Table 7.1. Thesis map: Research questions and key findings for each objective

Research Question 1: How can parents be supported to help their preschool child achieve appropriate levels of physical activity and sedentary behaviour?		
Study 1: Interviews with mothers of preschool children		
Chapter 3: Mothers' views of their preschool child's physical activity and sedentary behaviour in relation to the UK guidelines.	**Objectives:** • Understand mothers' views of their preschool children's PA and SB • Explore mothers' views of the UK PA and SB guidelines for the early years. • Identify opportunities for intervention to improve PA and SB in preschool children.	**Key findings:** • Mothers were not aware of the PA guidelines for this age group. • Mothers felt that their preschool child was sufficiently active and had appropriate levels of SB and so may not be receptive to receiving guideline information. • Mothers felt defining and quantifying physical activity in their preschool child problematic and so may not be making an accurate assessment of their child's activity levels. • Mothers felt that they were doing as much as they can, and the receiving guideline information would cause feelings of stress and guilt

Research Question 2: How can physical activity and sedentary behaviour guideline information be effectively presented and communicated to parents of preschool children?		
Study 2: Focus groups with parents of preschool children, incorporating a nominal group technique (NGT) methodology		

Chapter 4:
Helping parents define and quantify PA in preschool children
	Objectives:
	• Ascertain what words or phrases can be used to describe PA intensities in preschool children that are helpful and informative to parents
	• Generate a list of specific play activities to illustrate these PA intensities and to help parents initiate and promote PA for their preschool child.
		Key findings:
		• 'Still', 'Pottering' and 'Huff and Puff' were found to be useful terms to describe SB, LPA and MVPA respectively.
		• Moderate and vigorous intensities should be presented separately.
		• 'Sedentary behaviour' and 'vigorous intensity' had negative connotations to parents.
		• Thinking of PA intensity on a spectrum or scale rather than categories was useful to parents.
		• The top 3 play activities for each intensity were:
		  ○ SB: Television, board games/puzzles, using a tablet or smart phone
		  ○ LPA: Small world, role play, dressing up
		  ○ MVPA: Playing in the garden, rough and tumble, playing on the furniture

Chapter 5: Parents' views of how best to receive PA guidelines for their preschool child	**Objectives:** • Establish parents' preferences for communication and dissemination PA and SB guideline information.	**Key findings:** • Parents would like guidelines to have a less authoritarian feel. • Communication needs to be supportive and sensitive to the pressures of parenthood without being patronising or prescriptive • Clear information about what counts as PA is needed. • Ideas and advice on how to achieve the recommendations would be welcomed

		• Multiple formats of guideline material should be available. E.g. Printed media, websites, digital Apps. • Multiple channels should be used for disseminating guideline information e.g. Community settings (e.g. preschools and children's centres), social media and parenting websites
Study 3: National online survey of parents of preschool children		
Chapter 6: Parents preferences for the terminology, communication and dissemination of physical activity guideline information for preschool children	**Objectives:** Explore the issues and opinions raised in Study 2 with a larger and more diverse sample of participants	**Key findings:** • Terms: o 83.3% felt 'Still' was an acceptable term for SB o 93.2% felt 'Pottering' was an acceptable term for LPA o 95.9% felt 'On the go' was an acceptable term for MPA o 91.2% felt 'Huff and puff' was an acceptable term for VPA • The top 3 play activities for each intensity were: o SB: Reading, watching television, drawing o LPA: Cooking/baking, helping around the house, small world play o MPA: Playing in the garden, dancing, hide and seek o VPA: Running games, trampolining, obstacle courses • Receiving information online was the preferred format (73% rated good or very good) • Preschools and nurseries as a source of information was favoured by parents of all demographic groups (88% rated good or very good)

		• Parents from areas of higher depravation may be receptive to receiving information directly from health professional • Advice on how to know if your child is getting enough PA was felt to be useful information by 94% of participants

SB = sedentary behaviour; PA = physical activity; LPA = light intensity physical activity; MPA = moderate intensity physical activity; VPA = vigorous intensity physical activity; MVPA = moderate to vigorous intensity physical activity.

Research Question 1: How can parents be supported to help their preschool child achieve appropriate levels of physical activity and sedentary behaviour?

When this thesis commenced there was very little information on preschool children's physical activity and sedentary behaviour within the home environment[118 184]. The first study (Chapter 3) in this thesis entailed conducting qualitative interviews with mothers of preschool children in order to:

1. Understand mothers' views of their preschool child's physical activity and sedentary behaviour.
2. Explore mothers' views of the UK physical activity and sedentary behaviour guidelines for the early years.
3. Identify opportunities for intervention to improve physical activity and sedentary behaviour in preschool children.

7.1.1. Mothers' views of their preschool child's physical activity and sedentary behaviour

Participants in Study 1 viewed their preschool child as active. They felt that preschool children were naturally very active and require little encouragement to be more active. This view that preschool children have an inherent tendency to be active has been reported from a qualitative study of parents in Australia[125]. This perception may come from misperceiving a child's busyness as sufficient physical activity[126] and may be a manifestation of the sporadic nature of preschool children's activity behaviours, where moderate to vigorous physical activity mostly occurs in spurts of activity of less than one minute intercepted by periods of light physical activity or sedentary behaviour[185]. Participants in this study were satisfied with their child's sedentary time and valued this

time as an opportunity for quiet time or a time to rest. However, they debated whether preschool children were ever sedentary, because even when their preschool child is doing a sedentary activity, such as watching television or doing a jigsaw puzzle, they are still moving about. Although parents in this study believed that their preschool child is meeting the guidelines, they may not be making an accurate assessment. Research with parents of slightly older children (5 – 6 years) suggests that the majority of parents whose children do not meet the physical activity guidelines perceived their child's activity levels incorrectly[126]. This highlights a need to help parents accurately assess their child's activity behaviours.

Although participants reported that television viewing was the main form of screen-viewing for preschool children, they also had frequent access to mobile devices (e.g. mobile phones and tablets). As reported elsewhere, participants used screen-viewing as a way for children to rest [127-129], to use as an electronic babysitter[124 127-130], and as a behaviour management tool[128 129]. In addition to these reasons, this study found that mobile devices were used as an educational tool to facilitate learning. The majority of participants felt they needed to set rules and restrictions for the use of mobile devices by their preschool child. However, many participants found the restriction problematic because of the strong allure of mobile devices to preschool children. Thus, it may be beneficial to provide to parents' practical strategies and alternatives to screen-viewing.

7.1.2. Mothers′ views of the UK physical activity and sedentary behaviour guidelines for the early years

Knowledge of the physical activity guidelines has been associated with initiating positive behaviour change[18 19]. However, participants in this study were not aware there were physical activity and sedentary behaviour guidelines for preschool aged children, thereby highlighting the need for improved dissemination of these guidelines to parents. Once participants had been informed of the guidelines, they felt they were appropriate for preschool children in general but were not relevant to their family because they considered their preschool child was sufficiently active. However, participants also reported difficulty in interpreting the guideline recommendations. For instance, there was uncertainty about what play activities may count as physical activity and did not find the terms 'light' and 'moderate to vigorous' helpful or meaningful. This may indicate that interpreting the guidelines and making an accurate assessment of how their child's physical activity levels compare with the guideline recommendations is problematic for parents. The difficulty for parents to apply physical activity intensities to preschool children has been reported elsewhere[125], and may be related to a lack of distinction of what counts as physical activity within the guideline information and the sporadic nature of preschool children's play[26]. Therefore, physical activity and sedentary behaviour guidelines need to be translated into accessible public messages, which can be appropriately interpreted by parents.

Participants felt that they were already doing as much as they could with their child, and any additional physical activity or a reduction in sedentary time would cause feelings of pressure and stress for them. This reaction may have been exacerbated by their interpretation of the guideline recommendations, which was that an increase in physical

activity would require their child to take part in structured activities, such as going to a preschool group, rather than free play and the reduction of sedentary activities, such as screen-viewing, within the home. Previous qualitative studies have also reported parental concerns that increased physical activity and reduced sedentary behaviour would result in the displacement of activities which mothers valued such as reading and crafts[124 128 129]. Parents may benefit from gaining an understanding of how simple measures to increase physical activity at home can contribute to a preschool child's overall daily physical activity in order to reduce this perception.

> **Research Question 2:** How can physical activity and sedentary behaviour guidelines be effectively presented and communicated to parents of preschool children?

Studies 2 and 3 built on the findings from Study 1 and aimed to gain an understanding of how the guidelines could be more clearly explained and better disseminated to parents. Study 2 involved conducting focus groups with parents of preschool children (Chapters 4 and 5). Study 3 entailed a national online survey to verify the results from the focus groups with a larger and broader population (Chapter 6). The combined results of the two studies are discussed below in relation to four areas: terminology used within physical activity and sedentary behaviour guidelines; providing activity examples for different physical activity intensities; communication of guideline recommendations; and the dissemination of guidelines.

7.1.3. Terminology used in physical activity and sedentary behaviour guidelines

The data presented in this thesis highlights that there is a need to improve the communication of key terms. For example, guidelines need to define for parents as to what the terms 'physical activity' and 'sedentary behaviour' means for preschool children. Understanding what counts as physical activity was one of the main difficulties parents had with interpreting the guidelines in relation to their preschool child. A particular problem parents felt with the guidelines was the use of physical activity intensities. In this study (Chapter 3 & 4) and in previous research[125] parents found the terms 'light' and 'moderate-to-vigorous' physical activity to be difficult to apply to preschool children's physical activity behaviours. Thus, the use of lay terms to better describe physical activity intensities were explored to help provide a clearer understanding for parents. Through the initial phase of Study 2 and in consultation with parents, the terms Still, Pottering, On the Go, and Huff and Puff were selected for sedentary, light, moderate, and vigorous intensities respectively (Table 7.2). Parents felt these terms gave a visual image of the intended intensity and were rated as acceptable by the majority of participants in a nationwide survey. Within the focus groups (Study 2, Chapter 4) participants felt it was important to provide a description of physical activity intensities within guideline information. Descriptions, which were generated through the initial phase of Study 2, were discussed and refined with parents in the focus group and were then tested for acceptability within the national survey. The survey indicated that most parents would find the descriptions acceptable for their intended intensity.

Table 7.2 Physical activity intensity terms and descriptions

Sedentary activity	**Still** activities are carried out sitting or lying, with little or no movement
Light intensity activity	**Pottering** involves slow easy movements or standing play
Moderate intensity activity	**On the Go** is energetic play that make children warm and breath faster but still able to talk
Vigorous intensity activity	**Huff and Puff** is high energy play that makes children feel hot and breath hard and fast

The data presented in Chapter 4 highlighted that parents view the term 'sedentary' as a negative behaviour, and felt it implied the child was being lazy or disengaged. The general recommendation is that sedentary behaviour should be reduced, and so parents did not appreciate the term 'sedentary' being used for activities they viewed as positive and important, such as storytelling. A suggestion may be to use the term 'sedentary' only for activities that are targeted for reduction (i.e. screen viewing and being restrained in a car seat or pushchair) and the newly proposed term 'still' for sedentary activities that are to be encouraged (e.g. drawing, puzzles). Vigorous intensity activity was also viewed negatively as parents felt this implied challenging behaviour (e.g. boisterous or out of control), thereby discouraging parents to increase higher intensities of physical activity. Helping parents find ways to increase their child's physical activity intensity and manage their child's behaviour may be a useful addition to physical activity guideline information.

7.1.4. Providing activity examples of physical activity intensities

The data presented in this thesis emphasised the need to provide activity examples for physical activity intensities, which are relevant and realistic to parents and to help increase parental understanding of what the different physical activity intensities represent. Play activities, which could be used as examples for each intensity category were provided by participants in the focus groups. These were then rated using a nominal group technique (NGT) to ascertain which were the most relevant under particular situations and which may be useful for parents i.e. activities that need the least preparation, activities that require little or no supervision, activities which hold children's attention, activities that require little or no encouragement. The results from these scenarios may be useful when providing additional supportive information to parents. A final list of play activities for each intensity was produced based on combining the scores for all four scenarios. Similarly, a full list of play activities was presented to participants within the online survey (Study 3, Chapter 6), and participants were asked to select the most appropriate three activities for each intensity category in relation to their preschool child. The results were comparable between Study 2 and 3, with all but one of the top three activities summarised from the NGT study (Study 2, Chapter 4) appearing in the top ten activities chosen by participants in the survey (Study 3, Chapter 6). Since these play activities were provided by parents as examples of activities that their child enjoys doing, (this being confirmed by the national online survey), they offer realistic and relevant examples, which could form the basis of new examples in communication strategies.

7.1.5. Communication of guideline recommendations to parents

The findings from this study highlighted some key issues to be considered when presenting the physical activity and sedentary behaviour guidelines to parents. Firstly, as discussed above, parents found interpreting physical activity intensities for preschool children problematic. A suggestion from the focus groups (Study 2, Chapter 4) was that physical activity intensities should be visually represented on a scale or spectrum rather than distinct categories to reflect the sporadic nature of preschool children's play. Using a spectrum combined with the terms and definitions presented in Table 7.2, may be a beneficial strategy when communicating the physical activity guidelines to parents of preschool children.

Signposting parents to reliable sources of information and advice on physical activity and sedentary behaviours may be important. For example, parents felt that reducing sedentary behaviour would be challenging, especially in terms of reducing screen time and would like to be provided with realistic alternatives for screen-viewing and advice on how a reduction in screen-viewing could be managed (Chapter 3). The focus groups (Chapter 5) discussed information parents would find helpful and that parents (particularly mothers) would find additional information about physical activity and sedentary behaviour in preschool children useful. In particular, advice on how to assess if their preschool child was getting enough physical activity, and information about relevant activities available in the local area.

It is important to highlight that the tone used in guideline information appears to be important to parents. Previous research has reported that parents acknowledge the importance of physical activity and sedentary behaviour guidelines[186], and feel it is important that they come from a trustworthy and respectable source[124] . However, participants in Study 2 felt that it was also important that guideline information intended for parents should not feel authoritarian and should instead be more autonomous. The findings suggest that such information needs to be supportive to the pressures of parenthood and avoid presenting prescriptive recommendations with little information on how this could be achieved.

7.1.6. Dissemination of physical activity and sedentary behaviour guidelines

It is common to use several dissemination channels within social marketing health campaigns[168], and the findings from Studies 2 and 3 suggest that a range of dissemination channels may be appropriate to suit individual preferences. Preschools and nurseries were favoured and respected sources of information by the majority of parents, thus disseminating guidelines to parents through childcare settings may be advantageous. Community figures such as midwives, health visitors and child centre workers may be a dissemination channel worthy of further investigation as parents, particularly from areas of higher deprivation, were supportive of receiving information directly from health professionals. Social media was also suggested as a positive way of receiving information. Social media is a useful health promotion tool, with expansive reach to all demographic groups[158]. However, the challenge of social media is to maintain intention as well as attention and meaningful engagement is difficult to evaluate[158].

The results suggested that parents would prefer to read about physical activity and guideline information online through either dedicated or pre-existing websites (e.g. NHS or parenting websites such as Netmums). Printed media, such as leaflets or booklets were still a preference for many parents, notably those that were unemployed. Thus, sharing messages via these approaches is likely to be effective in engaging the widest group of parents.

7.2. Implications for policy and guidelines

7.2.1. UK physical activity and sedentary behaviour guidelines for the early years

Successful national policy frameworks for physical activity are based on four key factors: national recommendations on physical activity levels; national goals and targets; surveillance or health monitoring systems; and public education[114]. In a review of physical activity policy in England, Milton & Bauman[114] conclude that strong progress has been made in the development of national physical activity recommendations but there needs to be improvements in the implementation and maintenance of sustained public education campaigns. This is evident in the case of the physical activity and sedentary behaviour guidelines for the early years, where recommendations have been developed based on a robust scientific approach[88] but have failed to be effectively communicated to parents of preschool children.

The findings from this thesis suggest that signposting parents to relevant and reliable information is important, but currently this is not available as there is a paucity of relevant and reliable information available online specifically for parents of preschool children. When this thesis started, information about the guidelines was provided in the Department of Health and Social Care[159] (DHSC) factsheet (Appendix 5). and on a page on the NHS Live Well website (previously called NHS Choices). The NHS Live Well site has recently been updated (July 2018) and provides more information on what counts as physical activity for preschool children by describing movement behaviours (e.g. moving around, standing)[187]. However, the recommendations are given under the heading ‘toddlers’, which does not make it clear for parents of preschool children. The

Start4Life campaign[188] (a sister brand of Change4Life) led by Public Health England, provides information on active play for children under five years and is the one of the few sources of information directed specifically to parents from any government body. Remarkably, the information provided appears to neglect the preschool years. Likewise, the recommendations and information given by Start4Life are applicable to preschool aged children, however the information is targeted at toddlers and those just beginning to walk. This is a missed opportunity to provide parents appropriate information from a reputable source and which parents in this study confirmed was important to them (Chapter 4). It is quite clear there is inconsistency in physical activity messages and advice available online[162]. Providing a reliable source for guideline information and enabling health professionals to signpost parents of preschool children to guideline information is especially important but relies on consistency and coherent messaging from websites such as Start4Life and NHS Live Well.

Infographics

In 2016, the DHSC produced a series of infographics for different population groups to compliment the 2011 Start Active, Stay Active guidelines[189]. The infographic that incorporates guidelines for preschool children is 'Physical activity for the early years (from birth to 5 years)'and was published in 2018[190]. The infographic is primarily intended as a tool for health professionals and childcare centres to educate parents but may also be useful as a way of summarising the guidelines to parents. Parents' perceptions of this infographic are not known, but in light of the research undertaken in this thesis it makes some progress in the way physical activity guidelines are presented to parents. For instance, it imparts a positive message by presenting the benefits of increased activity. It includes of examples of activities, along with the slogan 'every

movement counts', which should help parents better understand what counts as physical activity for preschool children. The concept of presenting physical activity intensities on a spectrum dovetails well with this slogan, since it reinforces the view that physical activity can include a range of activities rather than solely moderate-to-vigorous intensity, in which parents often assumed was necessary. However, although the activity examples illustrate what counts as physical activity, these need to be consistent with the guideline messages presented to avoid confusion. For example, the 'Move more, Sit less, Play together' slogan within the infographic implies that sitting should be reduced, yet examples of activities that are likely to be carried out sitting down (i.e. messy play and object play) are provided as activity examples.

Parents in Study 1 and 2 felt that specific recommendations for screen viewing would be useful, along with alternative activities to replace screen-time. Sedentary behaviour levels are counterbalanced with physical activity levels, whereby a reduction in sedentary time is likely to cause an increase in physical activity (and vice versa). This can be seen as shifting time spent sedentary along the spectrum of activity[191]. Therefore, the replacement of screen-viewing with an alternative activity provides an opportunity for increased physical activity. However, the infographic[190] presents the recommendations for physical activity and omits any detail of the sedentary behaviour recommendations, apart from an indication to reduce sitting time within the slogan 'Move more, Sit less, Play together'. This may have been a missed opportunity to promote the sedentary behaviour recommendation to parents. It is important, within guideline information, to include sedentary behaviour recommendations along with additional support on how sedentary behaviour could be reduced.

The results from the online survey suggest that the majority of parents feel it would be helpful to find more information on assessing how their child compares to the recommendations, advice on how to increase physical activity and ideas of relevant play activities (Chapter 5 and 6). As infographics present a limited amount of information, signposting (e.g. through weblinks) to further sources of information may be important.

Figure 7.1. Department of Health and Social Care, Physical activity benefits for babies and children (birth to 5 years): Infographic.

24-hour Movement Guidelines

As discussed in Chapter 2, the UK chief medical officers are currently revising the physical activity guidelines for all population groups and are likely to follow the 24-hour movement approach adopted by Canada and Australia. As well as the addition for a specific recommendation for moderate to vigorous activity (MVPA), it has been recommended that the new guidelines may include a specific time recommendation for sedentary behaviour and an additional recommendation for sleep. If this recommendation is accepted, resources such as the infographic above will need to be updated. This provides an opportunity to consider how best to communicate physical activity and sedentary behaviour information to parents and to help promote the new guidelines.

As public perceptions of health messages are influenced by terminology and can result in confusion [192] care should be taken in the language used to explain the guidelines. The findings of this thesis suggest that careful consideration needs to be given to the terminology employed to accommodate the inclusion of the MVPA recommendation. Parents in this study felt that the terms 'moderate' and 'vigorous' should be presented separately. They also found these terms difficult to apply to preschool children and so alternative terminology should be considered. The visualisation of physical activity intensity on a spectrum may help illustrate these intensities in the context of overall activity, and is compatible with the 24-hour movement guidelines philosophy, which states that movement occurs on a continuum from sleep to sedentary to physical activity[86].

With the development of the new 24-hour movement guidelines, it is likely that a specific sedentary behaviour recommendation will form an important part of guideline materials. The current draft recommendation for sedentary behaviour in children aged 3-4 years is that sedentary screen time should be no more than 1 hour; less is better[88]. This recommendation is based only on the evidence available on 'passive' screen time (i.e. television and DVD) owing to the paucity of research on newer technologies, such as tablets and smartphones which have an interactive component. The research within this thesis suggests that these touchscreen devices contribute to preschool children's daily screen time. Thus, research efforts into the use of these devices with pre-schoolers is essential in order to make recommendations that are relevant to today's preschool children. However, the inclusion of a screen time recommendation will help parents make an informed decision about their child carrying out appropriate levels of screen-viewing (Chapter 3). The research in Study 2 (Chapter 4 and 5) found that parents find the term 'sedentary' a negative behaviour and feel it does not represent positive sedentary activities such as storytelling and puzzles. The new draft guidelines now clarify that sedentary activities in which the child is engaged such as reading, are to be encouraged. This helps provide some clarification on which behaviours are seen as positive and those that should be reduced.

With the publication of updated guidelines comes the challenge of raising knowledge of the guidelines to parents. The findings in this research suggest that disseminating information via childcare settings may be beneficial. The majority of participants would prefer to receive and read about guideline information online, so this may be achieved through relevant websites and electronic communication. In addition, the results

indicated that parents from areas of higher deprivation may favour receiving information directly from a health professional (Chapter 6), and this should be considered when promoting information to these hard to reach groups.

7.2.2. Recommendations for presenting guideline information to parents

Figure 7.2 presents a set of nine recommendations for presenting guideline information to parents based on findings from this thesis. Taking these recommendations into consideration, an example of an infographic that would be suitable for the promotion of the 24-hour movement guidelines in the UK is presented in Figure 7.3.

Figure 7.2 Recommendations for presenting physical activity and sedentary behaviour guideline information to parents of preschool children

Recommendations for presenting physical activity and sedentary behaviour guidelines to parents	
1	Physical activity intensity should be represented on a spectrum or scale rather than in distinct categories
2	Physical activity categories Moderate and Vigorous should be presented separately
3	The term sedentary behaviour should be reserved for describing behaviours targeted for reduction. E.g. screen-viewing, sitting in car seats.
4	Descriptions of each physical activity intensity should be given
5	Realistic and relevant play activity examples should be provided for each physical activity intensity
6	The use of the terms Still, Pottering, On the Go, Huff and Puff maybe helpful to describe physical activity intensities
7	Additional information or links to further advice and support should be provided alongside the recommendations
8	Information given should not be presented in a prescriptive, patronising or authoritarian tone
9	Information should be sensitive to the pressures of parenthood

Figure 7.3. Example of an infographic to present 24-hour movement guidelines for the early years to parents

7.3. Implications for research

Parents viewed their preschool child as active and were satisfied with how much time they spend being sedentary. They therefore did not perceive the need for behaviour change. To make sure this was an accurate perception, helping parents recognise appropriate physical activity and sedentary behaviour levels may be an important first step in enabling them to identify with health promotion initiatives and behaviour change interventions. Fortunately, the findings in this thesis suggest that parents may be receptive to receiving information about the physical activity and sedentary behaviour guidelines for preschool children. In particular, parents may welcome advice on how to recognise if their child is achieving the recommended levels and this may make a beneficial component to behaviour change interventions.

Parents felt that reducing screen-viewing would be problematic and that they may need additional advice and support to supplement the guidelines. For instance, suggestions for play activities within the home that may help increase physical activity, especially those activities which could offer an alternative to screen-viewing. Helping parents support their preschool child to play independently from an early age is likely to be key to reducing screen-viewing and adopting healthy lifestyle activities. Although dependent on the personality of the child, it appears to be a common theme for parents of young children[124], to resort to screen-viewing to entertain their child. Research in this area would benefit from collaborating with education and early years practitioners to identify appropriate ways for parents to encourage independent play from an early age. The results from the survey identified few differences between different demographic groups (based on IMD, country, ethnicity, gender). However, because of small numbers

in many of the groups it is not possible to draw any meaningful conclusions in this respect. It is evident this study would benefit from replication using larger, more diverse groups, since this may have important implications for the design of effective health promotion[161] .

Lessons learnt from this thesis may be valuable for recruiting parents to studies that focus on preschool children. In particular, preschools and nurseries appear to be a valuable line of communication between health professionals or research staff and parents. In addition, recruiting parents through social-media was advantageous for all three studies. Social-media enabled a cost- and time-effective way of reaching a large number of parents from different demographic groups. Parents within the studies also reported that they would find receiving information via social-media acceptable and so this line of recruitment and intervention delivery may be worth considering.

Further research is needed to assess if the use of terms and descriptions presented in this thesis within physical activity and sedentary behaviour guidelines material result in parents engaging more with the guidelines, and improve understanding of the physical activity and sedentary behaviour recommendations.

7.4. Strengths and limitations

This thesis has resulted in new insights that can be used to inform how physical activity and sedentary behaviour guidelines can be better presented and disseminated to parents of preschool children. The mixed method approach ensure different research questions were addressed using the most appropriate method, and allowed topic areas to be considered in light of both qualitative and quantitative evidence.

One of the major limitations of this thesis is that it is predominately based on the views of mothers. Fathers are difficult to recruit[193] and the paucity of research with fathers has been noted in other qualitative studies looking at physical activity and sedentary behaviour in young children[193 194]. As fathers have been found to play a different role in physical activity parenting practices compared to mothers[195], then fathers' views on the physical activity and sedentary behaviour guidelines should be explored further.

Ethnic minority groups were also not strongly represented. Since they make up 10% of the British population it is important to understand their views and how this information could be effectively communicated to different ethnic groups. Although no differences were identified between participants that were White-British and other ethnicities in the online survey, further research is needed about how best to communicate and disseminate information to different ethnic groups.

7.4.1. Personal Reflection

Throughout this thesis, I have signposted my personal circumstances with regards to becoming a mother and how this influenced the research I was carrying out. I feel that it is worth mentioning here how this research also shaped my parenting choices. For example, before becoming a parent I had a set of beliefs, based on my understanding of the research I had been studying, about the value of providing opportunities for physical activity and minimising screen-viewing. With my first child, I followed these beliefs to the best of my ability (for example, my son had no screen-time until the age of 2 and then it was very limited). As well as wanting the best start for my son, I also wanted to see for myself the challenges of following the guidelines. With the arrival of my second son, I found out first-hand the increased pressures of prioritising the needs of more than one child (e.g. entertaining a young child whilst feeding a baby and facing sleep-deprivation). Thus, through an understanding of my own circumstances, I placed importance in reflecting how personal circumstances can affect a parents' ability to follow the guidelines and prioritise helping their preschool child achieve them when other demands may feel more essential within my research.

As mentioned in the introduction to this thesis, this research spanned over six years, starting in 2012. When writing my original research proposal, preschool children's physical activity and sedentary behaviour was an emerging field of research and the UK guidelines had just been published the previous year. Prior to this, research tended to focus on how much physical activity in preschool children should achieve for optimal health, issues around how best to measure physical activity, and interventions within

preschools to increase physical activity (e.g.[25 94 118]). There was very little focus on parents' role in these behaviours. Now, nearly 8 years since the UK physical activity and sedentary behaviour guidelines were produced research in this areas is well established, with a greater understanding of these behaviours and their determinants in preschool children[17 83 104]. With this increased evidence base has come new and revised guidelines across many nations globally to reflect the need to incorporate all movement behaviours within one set of guidelines[80 86 88 90]. However, even though new research has highlighted the important role parents play in preschool children's physical activity behaviours, there is still very little involvement in parents when making policy decisions that affect them directly, such as how guideline information can be communicated and offer relevant support to parents. I hope that this thesis goes some way to provide an important and unheard voice from parents to researchers and policy makers.

I found the viva process a very positive experience. Undertaking a PhD, especially over a long period of time, whilst becoming a mother was challenging. Having the opportunity to discuss my research with two experts in the field, in such a constructive and encouraging manner helped put to rest the doubts and uncertainties I had about the value of the work I had spent so long producing. A suggestion that came from my examiners was it be a worthwhile endeavour to write a research paper detailing the modified nominal group technique methodology (Chapter 4) and its potential for use in future research in this field. This is something I would like to undertake in the near future, along with a paper presenting the combined results of Studies 2 and 3 (Chapters 4, 5 & 6).

7.5. Conclusions

This thesis gained an understanding of parents' views about their preschool child's physical activity and sedentary behaviours, and the UK physical activity and sedentary behaviour guidelines for the early years, and investigated how they can be better communicated to parents of preschool children. The findings show that there are a number of issues that prevent parents from relating to the current guidelines and influences their reaction to it. They suggest guideline information should consider the terminology used and provide realistic activity examples in order to avoid misinterpretation and alienation. In terms of dissemination, several channels and formats should be provided to suit individual preferences. Future research should focus on exploring the views of fathers and ethnic minority groups, and could assess whether presenting and communicating guideline information as suggested in this thesis makes it more accessible to parents, and results in them trying to increase their preschool child's activity levels and reduce their sedentary time.

REFERENCES

1. Goldfield GS, Harvey A, Grattan K, Adamo KB. Physical activity promotion in the preschool years: a critical period to intervene. *Int J Environ Res Public Health* 2012;9(4):1326-42.

2. Carson V, Lee E-Y, Hewitt L, Jennings C, Hunter S, Kuzik N, Stearns JA, Unrau SP, Poitras VJ, Gray C, Adamo KB, Janssen I, Okely AD, Spence JC, Timmons BW, Sampson M, Tremblay MS. Systematic review of the relationships between physical activity and health indicators in the early years (0-4 years). *BMC Public Health* 2017;17(Suppl 5):854. doi: 10.1186/s12889-017-4860-0

3. Poitras VJ, Gray CE, Janssen X, Aubert S, Carson V, Faulkner G, Goldfield GS, Reilly JJ, Sampson M, Tremblay MS. Systematic review of the relationships between sedentary behaviour and health indicators in the early years (0-4 years). *BMC Public Health* 2017;17(Suppl 5):868-68. doi: 10.1186/s12889-017-4849-8

4. LeBlanc A, Spence J, Carson V, Connor Gorber S, Dillman C, Janssen I, Kho M, Stearns J, Timmons B, Tremblay M. Systematic review of sedentary behaviour and health indicators in the early years (aged 0-4 years). *Applied Physiology, Nutrition, and Metabolism* 2012;37(4):753 - 72.

5. Biddle S, Pearson N, Ross G, Braithwaite R. Tracking of sedentary behaviours of young people: a systematic review. *Preventative Medicine* 2010;51(5):345 - 51.

6. Certain LK, Kahn RS. Prevalence, correlates, and trajectory of television viewing among infants and toddlers. *Pediatrics* 2002;109:634-42.

7. Zimmerman FJ, Christakis DA. Children's television viewing and cognitive outcomes: a longitudinal analysis of national data. *Archives of Pediatric Adolescent Medicine* 2005;159(7):619-25.

8. Pate RR, Baranowski T, Dowda M, Trost SG. Tracking of physical activity in young children. *Med Sci Sports Exerc* 1996;28(1):92-6. [published Online First: 1996/01/01]

9. Department of Health. Start Active, Stay Active: A report on physical activity from the four home countries' Chief Medical Officers. London: Department of Health, 2011.

10. Hesketh KR, McMinn AM, Ekelund U, Sharp SJ, Collings PJ, Harvey NC, Godfrey KM, Inskip HM, Cooper C, van Sluijs EM. Objectively measured physical activity in four-year-old British children: a cross-sectional analysis of activity patterns segmented across the day. *International Journal of Behavioral Nutrition and Physical Activity* 2014;11(1):1.

11. O'Dwyer MV, Foweather L, Stratton G, Ridgers ND. Physical activity in non-overweight and overweight UK preschool children: Preliminary findings and methods of the Active Play Project. *Science & Sports* 2011;26(6):345-49. doi: http://dx.doi.org/10.1016/j.scispo.2011.01.006

12. Health Survey for England 2008: Physical activity and fitness. Leeds: The Information Centre, 2010.

13. Jago R, Sebire SJ, Edwards MJ, Thompson JL. Parental TV viewing, parental self-efficacy, media equipment and TV viewing among preschool children. *European journal of pediatrics* 2013;172(11):1543-45.

14. Yao CA, Rhodes RE. Parental correlates in child and adolescent physical activity: a meta-analysis. *The international journal of behavioral nutrition and physical activity* 2015;12:10-10. doi: 10.1186/s12966-015-0163-y

15. Biddle SJH, Atkin AJ, Cavill N, Foster C. Correlates of physical activity in youth: a review of quantitative systematic reviews. *International Review of Sport and Exercise Psychology* 2011;4(1):25-49. doi: 10.1080/1750984X.2010.548528

16. Xu H, Wen LM, Rissel C. Associations of parental influences with physical activity and screen time among young children: a systematic review. *J Obes* 2015;2015:546925. doi: 10.1155/2015/546925 [published Online First: 2015/04/16]

17. Hesketh KR, O'Malley C, Paes VM, Moore H, Summerbell C, Ong KK, Lakshman R, van Sluijs EMF. Determinants of Change in Physical Activity in Children 0–6 years of Age: A Systematic Review of Quantitative Literature. *Sports Medicine* 2017;47(7):1349-74. doi: 10.1007/s40279-016-0656-0

18. Snyder LB. Health communication campaigns and their impact on behavior. *Journal of Nutrition Education and Behaviour* 2007;39(2 Suppl):S32-40. doi: 10.1016/j.jneb.2006.09.004 [published Online First: 2007/03/06]

19. Michie S, Abraham C, Whittington C, McAteer J, Gupta SJHP. Effective techniques in healthy eating and physical activity interventions: a meta-regression. *Health Psychology* 2009;28(6):690.

20. Plotnikoff RC, Trinh LJE, reviews ss. Protection motivation theory: is this a worthwhile theory for physical activity promotion? *Exercise and Sport Sciences Reviews* 2010;38(2):91-98.

21. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep* 1985;100(2):126-31. [published Online First: 1985/03/01]

22. Jette M, Sidney K, Blumchen G. Metabolic equivalents (METS) in exercise testing, exercise prescription, and evaluation of functional capacity. *Clin Cardiol* 1990;13(8):555-65. [published Online First: 1990/08/01]

23. Ainsworth BE, Haskell WL, Herrmann SD, Meckes N, Bassett Jr DR, Tudor-Locke C, Greer JL, Vezina J, Whitt-Glover MC, Leon ASJM, sports si, exercise. 2011 Compendium of Physical Activities: a second update of codes and MET values. *Med Sci Sports Exerc* 2011;43(8):1575-81.

24. Reilly JJ, Okely AD, Almond L, Cardon G, Prosser L, Hubbard J. Making the case for UK Physical Activity Guidelines for Early Years: Recommendations and draft summary statements based on the current evidence. : Department of Health and Social Care 2010.

25. Timmons BW, Naylor PJ, Pfeiffer KA. Physical activity for preschool children--how much and how? *Canadian Journal of Public Health* 2007;98(2):S122-34.

26. Ruiz RM, Tracy D, Sommer EC, Barkin SL. A novel approach to characterize physical activity patterns in preschool-aged children. *Obesity* 2013;21(11):2197-203.

27. Garvey C. Play: Harvard University Press 1990.

28. Martin P, Caro TM. On the Functions of Play and Its Role in Behavioral Development. In: Rosenblatt JS, Beer C, Busnel M-C, et al., eds. Advances in the Study of Behavior: Academic Press 1985:59-103.

29. Dwyer GM, Baur LA, Hardy LL. The challenge of understanding and assessing physical activity in preschool-age children: Thinking beyond the framework of intensity, duration and frequency of activity. *Journal of Science and Medicine in Sport* 2009;12(5):534-6.

30. Sedentary Behaviour Research N. Letter to the Editor: Standardized use of the terms "sedentary" and "sedentary behaviours". *Applied Physiology, Nutrition, and Metabolism* 2012;37(3):540-42. doi: 10.1139/h2012-024

31. Reilly JJ, Janssen X, Cliff DP, Okely AD. Appropriateness of the definition of 'sedentary' in young children: Whole-room calorimetry study. *Journal of Science and Medicine in Sport* 2015;18(5):565-68. doi: https://doi.org/10.1016/j.jsams.2014.07.013

32. Tremblay M, LeBlanc A, Kho M, Saunders T, Larouche R, Colley R, Goldfield G, Gorber S. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity* 2011;8(1):98.

33. Prentice-Dunn H, Prentice-Dunn S. Physical activity, sedentary behavior, and childhood obesity: a review of cross-sectional studies. *Psychology and Health in Medicine* 2012;17(3):255-73.

34. Carson V, Kuzik N, Hunter S, Wiebe SA, Spence JC, Friedman A, Tremblay MS, Slater LG, Hinkley T. Systematic review of sedentary behavior and cognitive development in early childhood. *Preventive Medicine* 2015;78:115-22. doi: https://doi.org/10.1016/j.ypmed.2015.07.016

35. School admissions 2018 [Available from: https://www.gov.uk/schools-admissions accessed 01/12/2018.

36. Bentley GF, Jago R, Turner KM. Mothers' perceptions of the UK physical activity and sedentary behaviour guidelines for the early years (Start Active, Stay Active): a qualitative study. *BMJ Open* 2015;5(9) doi: 10.1136/bmjopen-2015-008383

37. Bentley GF, Turner KM, Jago R. Mothers' views of their preschool child's screen-viewing behaviour: a qualitative study. *BMC Public Health* 2016;16(1):718. doi: 10.1186/s12889-016-3440-z

38. Santrock J. Child Development 14th ed: McGraw-Hill Education 2013.

39. Hills AP, King NA, Armstrong TP. The Contribution of Physical Activity and Sedentary Behaviours to the Growth and Development of Children and Adolescents. *Journal of Sports Medicine* 2007;37(6):533-45. doi: 10.2165/00007256-200737060-00006

40. Timmons BW, Leblanc AG, Carson V, Connor Gorber S, Dillman C, Janssen I, Kho ME, Spence JC, Stearns JA, Tremblay MS. Systematic review of physical activity and health in the early years (aged 0-4 years). *Applied Physiology, Nutrion andMetababolism* 2012;37(4):773-92.

41. Collings PJ, Brage S, Ridgway CL, Harvey NC, Godfrey KM, Inskip HM, Cooper C, Wareham NJ, Ekelund U. Physical activity intensity, sedentary time, and body composition in preschoolers. *The American journal of clinical nutrition* 2013;97(5):1020-28.

42. Janz K, Burns T, Levy S. Tracking of activity and sedentary behaviors in childhood: the Iowa bone development study. *American Journal of Preventative Medicine* 2005;29(3):171 - 78.

43. Carson V, Hunter S, Kuzik N, Wiebe SA, Spence JC, Friedman A, Tremblay MS, Slater L, Hinkley T. Systematic review of physical activity and cognitive development in early childhood. *Journal of Science and Medicine in Sport* 2016;19(7):573-78. doi: https://doi.org/10.1016/j.jsams.2015.07.011

44. Williams HG, Pfeiffer KA, O'Neill JR, Dowda M, McIver KL, Brown WH, Pate RR. Motor skill performance and physical activity in preschool children. *Obesity* 2008;16(6):1421-26.

45. Webster EK, Martin CK, Staiano AE. Fundamental motor skills, screen-time, and physical activity in preschoolers. *Journal of Sport and Health Science* 2018 doi: https://doi.org/10.1016/j.jshs.2018.11.006

46. NHS Digital. National Child Measurement Programme 2007/2008. School year headline results. 2008 [Available from: http://www.ic.nhs.uk/webfiles/publications/ncmp/ncmp0708/NCMP%202007-08%20Report.pdf accessed 10/11/2011 2011.

47. Metallinos-Katsaras ES, Freedson PS, Fulton JE, Sherry B. The Association Between an Objective Measure of Physical Activity and Weight Status in Preschoolers. *Obesity* 2007;15(3):686-94. doi: 10.1038/oby.2007.571

48. Jago R, Baranowski T, Baranowski JC, Thompson D, Greaves KA. BMI from 3-6 y of age is predicted by TV viewing and physical activity, not diet. *International Journal of Obesity* 2005;29(6):557-64.

49. Janssen I, LeBlanc AG. Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity* 2010;7(1):40. doi: 10.1186/1479-5868-7-40

50. Evensen E, Wilsgaard T, Furberg AS, Skeie G. Tracking of overweight and obesity from early childhood to adolescence in a population-based cohort - the Tromso Study, Fit Futures. *BMC Pediatr* 2016;16:64. doi: 10.1186/s12887-016-0599-5 [published Online First: 2016/05/12]

51. Radesky JS, Schumacher J, Zuckerman B. Mobile and Interactive Media Use by Young Children: The Good, the Bad, and the Unknown. *Pediatrics* 2015;135(1):1-3. doi: 10.1542/peds.2014-2251

52. te Velde SJ, van Nassau F, Uijtdewilligen L, van Stralen MM, Cardon G, De Craemer M, Manios Y, Brug J, Chinapaw MJM, ToyBox-study g. Energy balance-related behaviours associated with overweight and obesity in preschool children: a systematic review of prospective studies. *Obesity Reviews* 2012;13:56-74. doi: 10.1111/j.1467-789X.2011.00960.x

53. Cox R, Skouteris H, Rutherford L, Fuller-Tyszkiewicz M, Dell' Aquila D, Hardy LL. Television viewing, television content, food intake, physical activity and body mass index: a cross-sectional study of preschool children aged 2-6 years. *Health Promotion Journal of Australia* 2012;23(1):58-62.

54. Pagani LS, Fitzpatrick C, Barnett TA, Dubow E. Prospective associations between early childhood television exposure and academic, psychosocial, and physical well-being by middle childhood. *Archives of Pediatric Adolescent Medicine* 2010;164(5):425-31.

55. Jackson DM, Djafarian K, Stewart J, Speakman JR. Increased television viewing is associated with elevated body fatness but not with lower total energy expenditure in children. *American Journal of Clinical Nutrition* 2009;89(4):1031-6.

56. Mendoza J, Zimmerman F, Christakis D. Television viewing, computer use, obesity and adiposity in US preschool children. *International Journal of Behavioral Nutrition and Physical Activity* 2007;4:44.

57. Rey-Lopez JP, Vicente-Rodriguez G, Biosca M, Moreno LA. Sedentary behaviour and obesity development in children and adolescents. *Nutrition, Metabolism and Cardiovascular Diseases* 2008;18(3):242-51. doi: 10.1016/j.numecd.2007.07.008 [published Online First: 2007/12/18]

58. Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA* 1999;282:1561-67.

59. Saunders TJ, Chaput JP, Tremblay MS. Sedentary behaviour as an emerging risk factor for cardiometabolic diseases in children and youth. *Can J Diabetes* 2014;38(1):53-61. doi: 10.1016/j.jcjd.2013.08.266 [published Online First: 2014/02/04]

60. LeBlanc AG, Spence JC, Carson V, Connor Gorber S, Dillman C, Janssen I, Kho ME, Stearns JA, Timmons BW, Tremblay MS. Systematic review of sedentary behaviour and health indicators in the early years (aged 0-4 years). *Applied Physiology, Nutrition, and Metabolism* 2012;37(4):753-72.

61. Bull FC, Biddle S, Buchner D, Fergusion R, Foster C, Fox K, Haskell WL, Mutrie M, Reilly JJ, Riddoch C, Skelton D, Stratton G, Tremblay MS, Watts C. Physical Activity Guidelines in the U.K.: Review and Recommendations. : School of Sport, Exercise and Health Sceinces, Loughborough University, 2010.

62. Pagani LS, Fitzpatrick C, Barnett TA. Early childhood television viewing and kindergarten entry readiness. *Pediatr Res* 2013;74(3):350-5. doi: 10.1038/pr.2013.105 [published Online First: 2013/06/22]

63. Wright JC, Huston AC, Murphy KC, St. Peters M, PiÃ±on M, Scantlin R, Kotler J. The Relations of Early Television Viewing to School Readiness and Vocabulary of Children from Low-Income Families: The Early Window Project. *Child Development* 2001;72(5):1347-66. doi: 10.1111/1467-8624.t01-1-00352

64. Taverno Ross S, Dowda M, Saunders R, Pate R. Double dose: the cumulative effect of TV viewing at home and in preschool on children's activity patterns and weight status. *Pediatric Excerise Science* 2013;25(2):262-72. [published Online First: 2013/03/19]

65. Carson V, Janssen I. Volume, patterns, and types of sedentary behavior and cardio-metabolic health in children and adolescents: a cross-sectional study. *BMC Public Health* 2011;11(1):274.

66. Stamatakis E, Coombs N, Jago R, Gama A, Mourao I, Nogueira H, Rosado V, Padez C. Type-specific screen time associations with cardiovascular risk markers in children. *American Journal of Preventative Medicine* 2013;44(5):481-8. doi: 10.1016/j.amepre.2013.01.020 [published Online First: 2013/04/20]

67. Ekelund U, Brage S, Froberg K, Harro M, Anderssen SA, Sardinha LB, Riddoch C, Andersen LB. TV viewing and physical activity are independently associated with metabolic risk in children: the European Youth Heart Study. *PLoS Med* 2006;3(12):e488. doi: 10.1371/journal.pmed.0030488 [published Online First: 2006/12/30]

68. Marinelli M, Sunyer J, Alvarez-Pedrerol M, Iniguez C, Torrent M, Vioque J, Turner MC, Julvez J. Hours of television viewing and sleep duration in children: a multicenter birth cohort study. *JAMA Pediatr* 2014;168(5):458-64. doi: 10.1001/jamapediatrics.2013.3861 [published Online First: 2014/03/13]

69. Magee C, Caputi P, Iverson D. Lack of sleep could increase obesity in children and too much television could be partly to blame. *Acta Paediatria* 2014;103(1):e27-31. doi: 10.1111/apa.12447 [published Online First: 2013/10/15]

70. Magee CA, Lee JK, Vella SA. Bidirectional relationships between sleep duration and screen time in early childhood. *JAMA Pediatr* 2014;168(5):465-70. doi: 10.1001/jamapediatrics.2013.4183 [published Online First: 2014/03/05]

71. Garrison M, Liekweg K, Christakis D. Media use and child sleep: The impact of content, timing, and environment. *Pediatrics* 2011;128(1):29 - 35.

72. Ford C, Ward D, White M. Television viewing associated with adverse dietary outcomes in children ages 2-6. *Obesity Reviews* 2012;13(12):1139-47.

73. Hinkley T, Verbestel V, Ahrens W, Lissner L, Molnar D, Moreno LA, Pigeot I, Pohlabeln H, Reisch LA, Russo P, Veidebaum T, Tornaritis M, Williams G, De Henauw S, De Bourdeaudhuij I. Early childhood electronic media use as a predictor of poorer well-being: a prospective cohort study. *JAMA Pediatr*

2014;168(5):485-92. doi: 10.1001/jamapediatrics.2014.94 [published Online First: 2014/03/19]

74. Hinkley T, Teychenne M, Downing KL, Ball K, Salmon J, Hesketh KD. Early childhood physical activity, sedentary behaviors and psychosocial well-being: A systematic review. *Preventive Medicine* 2014;62:182-92.

75. Manganello JA, Taylor CA. Television exposure as a risk factor for aggressive behavior among 3-year-old children. *Archives of Pediatric Adolescent Medicine* 2009;163(11):1037-45.

76. Carson V, Stearns J, Janssen I. The Relationship Between Parental Physical Activity and Screen Time Behaviors and the Behaviors of their Young Children. *Pediatr Exerc Sci* 2015;27(3):390-5. doi: 10.1123/pes.2014-0214 [published Online First: 2015/04/29]

77. Kennedy CM, Strzempko F, Danford C, Kools S. Children's perceptions of TV and health behavior effects. *Journal of Nursing Scholarship* 2002;34(3):289-94. [published Online First: 2002/09/20]

78. Carson V, Chaput J-P, Janssen I, Tremblay MS. Health associations with meeting new 24-hour movement guidelines for Canadian children and youth. *Preventive Medicine* 2017;95:7-13. doi: https://doi.org/10.1016/j.ypmed.2016.12.005

79. Cliff DP, McNeill J, Vella SA, Howard SJ, Santos R, Batterham M, Melhuish E, Okely AD, de Rosnay M. Adherence to 24-Hour Movement Guidelines for the Early Years and associations with social-cognitive development among Australian preschool children. *BMC Public Health* 2017;17(5):857. doi: 10.1186/s12889-017-4858-7

80. Tremblay MS, Carson V, Chaput J-P, Connor Gorber S, Dinh T, Duggan M, Faulkner G, Gray CE, Gruber R, Janson K, Janssen I, Katzmarzyk PT, Kho ME, Latimer-Cheung AE, LeBlanc C, Okely AD, Olds T, Pate RR, Phillips A, Poitras VJ, Rodenburg S, Sampson M, Saunders TJ, Stone JA, Stratton G, Weiss SK, Zehr L. Canadian 24-Hour Movement Guidelines for Children and Youth: An Integration of Physical Activity, Sedentary Behaviour, and Sleep. *Applied Physiology, Nutrition, and Metabolism* 2016;41(6 (Suppl. 3)):S311-S27. doi: 10.1139/apnm-2016-0151

81. Berglind D, Ljung R, Tynelius P, Brooke HL. Cross-sectional and prospective associations of meeting 24-h movement guidelines with overweight and obesity in preschool children. *Pediatric Obesity* 2018;13(7):442-49. doi: doi:10.1111/ijpo.12265

82. Chaput J-P, Colley RC, Aubert S, Carson V, Janssen I, Roberts KC, Tremblay MS. Proportion of preschool-aged children meeting the Canadian 24-Hour Movement Guidelines and associations with adiposity: results from the Canadian Health Measures Survey. *BMC Public Health* 2017;17(5):829. doi: 10.1186/s12889-017-4854-y

83. Kuzik N, Poitras VJ, Tremblay MS, Lee E-Y, Hunter S, Carson V. Systematic review of the relationships between combinations of movement behaviours and

health indicators in the early years (0-4 years). *BMC Public Health* 2017;17(5):849. doi: 10.1186/s12889-017-4851-1

84. Roman-Vinas B, Chaput JP, Katzmarzyk PT, Fogelholm M, Lambert EV, Maher C, Maia J, Olds T, Onywera V, Sarmiento OL, Standage M, Tudor-Locke C, Tremblay MS. Proportion of children meeting recommendations for 24-hour movement guidelines and associations with adiposity in a 12-country study. *International Journal of Behavioral Nutrition and Physical Activity* 2016;13(1):123. doi: 10.1186/s12966-016-0449-8 [published Online First: 2016/11/27]

85. Australian Government, Department of Health. Australian 24-Hour Movement Guidelines for the Early Years (Birth to 5 years) 2017 [Available from: http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines#npa05 accessed 01/05/2018.

86. Tremblay MS, Chaput J-P, Adamo KB, Aubert S, Barnes JD, Choquette L, Duggan M, Faulkner G, Goldfield GS, Gray CE, Gruber R, Janson K, Janssen I, Janssen X, Jaramillo Garcia A, Kuzik N, LeBlanc C, MacLean J, Okely AD, Poitras VJ, Rayner M-E, Reilly JJ, Sampson M, Spence JC, Timmons BW, Carson V. Canadian 24-Hour Movement Guidelines for the Early Years (0–4 years): An Integration of Physical Activity, Sedentary Behaviour, and Sleep. *BMC Public Health* 2017;17(5):874. doi: 10.1186/s12889-017-4859-6

87. National Association for Sport and Physical Education. Active Start: A Statement of Physical Acitvity Guidelines for Children from Birth to Age 5. 2nd Edition ed: American Alliance for Health, Physical Education, Recreation, and Dance 2009.

88. Reilly JJ, Hughes AR, Janssen X, Martin A, Hesketh K, Livingston S, Hill C, Kipping R, Draper C, Okely AD, Nimmo R. Expert Working Group Working Paper: UK physical activity guidelines: Draft review and recommendations for the Under 5's. 2018 [updated August 2018. Available from: http://www.bristol.ac.uk/media-library/sites/sps/documents/cmo/under-5s-technical-report.pdf accessed 23/11/2018.

89. Chaput JP, Carson V, Gray CE, Tremblay MS. Importance of all movement behaviors in a 24 hour period for overall health. *Int J Environ Res Public Health* 2014;11(12):12575-81. doi: 10.3390/ijerph111212575 [published Online First: 2014/12/09]

90. Okely AD, Ghersi D, Hesketh KD, Santos R, Loughran SP, Cliff DP, Shilton T, Grant D, Jones RA, Stanley RM, Sherring J, Hinkley T, Trost SG, McHugh C, Eckermann S, Thorpe K, Waters K, Olds TS, Mackey T, Livingstone R, Christian H, Carr H, Verrender A, Pereira JR, Zhang Z, Downing KL, Tremblay MS. A collaborative approach to adopting/adapting guidelines - The Australian 24-Hour Movement Guidelines for the early years (Birth to 5 years): an integration of physical activity, sedentary behavior, and sleep. *BMC Public Health* 2017;17(5):869. doi: 10.1186/s12889-017-4867-6

91. School for Policy Studies UoB. UK physical activity guideline review: National Consultation 2018 [Available from:

http://www.bristol.ac.uk/sps/research/projects/current/physical-activity/consultation/ accessed 01/09/2018.

92. Bornstein DB, Beets MW, Byun W, McIver K. Accelerometer-derived physical activity levels of preschoolers: a meta-analysis. *Journal of Science and Medicine in Sport* 2011;14(6):504-11.

93. O'Dwyer M, Fairclough SJ, Ridgers ND, Knowles ZR, Foweather L, Stratton G. Patterns of Objectively Measured Moderate-to-Vigorous Physical Activity in Preschool Children. *Journal of physical activity & health* 2014;11(6):1233-38. doi: 10.1123/jpah.2012-0163

94. Oliver M, Schofield GM, Kolt GS. Physical activity in preschoolers: understanding prevalence and measurement issues. *Sports Medicine* 2007;37(12):1045-70.

95. Colley RC, Garriguet D, Adamo KB, Carson V, Janssen I, Timmons BW, Tremblay MS. Physical activity and sedentary behavior during the early years in Canada: a cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity* 2013;10(1):54.

96. Cliff DP, Hesketh KD, Vella SA, Hinkley T, Tsiros MD, Ridgers ND, Carver A, Veitch J, Parrish A-M, Hardy LL, Plotnikoff RC, Okely AD, Salmon J, Lubans DR. Objectively measured sedentary behaviour and health and development in children and adolescents: systematic review and meta-analysis. *Obesity Reviews* 2016;17(4):330-44. doi: doi:10.1111/obr.12371

97. Hinkley T, Salmon J, Okely AD, Crawford D. The correlates of preschoolers' compliance with screen recommendations exist across multiple domains. *Preventative Medicine* 2013;57(3):212-9. doi: 10.1016/j.ypmed.2013.05.020 [published Online First: 2013/06/05]

98. Tandon PS, Zhou C, Lozano P, Christakis DA. Preschoolers' total daily screen time at home and by type of child care. *Journal of Pediatrics* 2011;158(2):297-300.

99. Santos R, Zhang Z, Pereira JR, Sousa-Sá E, Cliff DP, Okely AD. Compliance with the Australian 24-hour movement guidelines for the early years: associations with weight status. *BMC Public Health* 2017;17(5):867. doi: 10.1186/s12889-017-4857-8

100. Bauman AE, Sallis JF, Dzewaltowski DA, Owen N. Toward a better understanding of the influences on physical activity: The role of determinants, correlates, causal variables, mediators, moderators, and confounders. *American Journal of Preventive Medicine* 2002;23(2, Supplement 1):5-14. doi: https://doi.org/10.1016/S0749-3797(02)00469-5

101. Hinkley T, Crawford D, Salmon J, Okely AD, Hesketh K. Preschool children and physical activity: a review of correlates. *American Journal of Preventative Medicine* 2008;34(5):435-41.

102. De Craemer M, De Decker E, De Bourdeaudhuij I, Vereecken C, Deforche B, Manios Y, Cardon G. Correlates of energy balance-related behaviours in preschool children: a systematic review. *Obesity Reviews* 2012;1:13-28.

103. Bingham DD, Costa S, Hinkley T, Shire KA, Clemes SA, Barber SE. Physical Activity During the Early Years: A Systematic Review of Correlates and Determinants. *American Journal of Preventive Medicine* 2016;51(3):384-402. doi: https://doi.org/10.1016/j.amepre.2016.04.022

104. Schmutz EA, Haile SR, Leeger-Aschmann CS, Kakebeeke TH, Zysset AE, Messerli-Bürgy N, Stülb K, Arhab A, Meyer AH, Munsch S, Puder JJ, Jenni OG, Kriemler S. Physical activity and sedentary behavior in preschoolers: a longitudinal assessment of trajectories and determinants. *International Journal of Behavioral Nutrition and Physical Activity*

2018;15(1):35. doi: 10.1186/s12966-018-0670-8

105. Schmutz EA, Leeger-Aschmann CS, Radtke T, Muff S, Kakebeeke TH, Zysset AE, Messerli-Bürgy N, Stülb K, Arhab A, Meyer AH, Munsch S, Puder JJ, Jenni OG, Kriemler S. Correlates of preschool children's objectively measured physical activity and sedentary behavior: a cross-sectional analysis of the SPLASHY study. *International Journal of Behavioral Nutrition and Physical Activity* 2017;14(1):1. doi: 10.1186/s12966-016-0456-9

106. Hinkley T, Salmon J, Okely AD, Trost SG. Correlates of sedentary behaviours in preschool children: a review. *International Journal of Behavioral Nutrition and Physical Activity* 2010;7(66):1479-5868.

107. Yao CA, Rhodes RE. Parental correlates in child and adolescent physical activity: a meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity* 2015;12(1):1-38. doi: 10.1186/s12966-015-0163-y

108. Downing KL, Hinkley T, Salmon J, Hnatiuk JA, Hesketh KD. Do the correlates of screen time and sedentary time differ in preschool children? *BMC Public Health* 2017;17(1):285. doi: 10.1186/s12889-017-4195-x

109. Hoyos Cillero I, Jago R. Systematic review of correlates of screen-viewing among young children. *Preventive Medicine* 2010;51(1):3-10. doi: 10.1016/j.ypmed.2010.04.012

110. Salmon J, Timperio A, Telford A, Carver A, Crawford D. Association of Family Environment with Children's Television Viewing and with Low Level of Physical Activity. *Obesity Research* 2005;13(11):1939-51. doi: 10.1038/oby.2005.239

111. Jago R, Thompson JL, Sebire SJ, Wood L, Pool L, Zahra J, Lawlor DA. Cross-sectional associations between the screen-time of parents and young children: differences by parent and child gender and day of the week. *International Journal of Behavioral Nutrition and Physical Activity* 2014;11:54. doi: 10.1186/1479-5868-11-54 [published Online First: 2014/04/25]

112. World Health Organisation. Global action plan on physical activity 2018-2030: more active people for a healthier world. Geneva: World Health Organisation 2018 [Available from: http://apps.who.int/iris/bitstream/handle/10665/272722/9789241514187-eng.pdf.

113. World Health Organisation. Global Action Plan for the prevention and control of noncommunicable diseases 2013-2020 Geneva: World Health Organisation 2013 [Available from: https://www.who.int/nmh/events/ncd_action_plan/en/.

114. Milton K, Bauman A. A critical analysis of the cycles of physical activity policy in England. *International Journal of Behavioral Nutrition and Physical Activity* 2015;12(1):8. doi: 10.1186/s12966-015-0169-5 [published Online First: 2015/02/02]

115. Health Do. Change4Life 2009 [Available from: http://www.nhs.uk/Change4Life/Pages/be-more-active.aspx accessed 29/01/2015.

116. Department of Health. Change4Life One Year On. 2010

117. Croker H, Lucas R, Wardle J. Cluster-randomised trial to evaluate the 'Change for Life' mass media/ social marketing campaign in the UK. *BMC Public Health* 2012;12(1):404. doi: 10.1186/1471-2458-12-404

118. Hesketh KD, Campbell KJ. Interventions to prevent obesity in 0-5 year olds: an updated systematic review of the literature. *Obesity* 2010;18(1):429.

119. Ministry of Housing, Communities and Local Government. English Indices of Deprivation 2010 2015 [Available from: https://data.gov.uk/dataset/4c4c4e50-0925-4ae6-b45c-ca8a350bd5c6/english-indices-of-deprivation-2010 accessed 01/04/2014.

120. Department of Health and Social Care. Factsheet 2: Physical activity guidelines for early years (under 5's) - for children who are capable of walking 2011 [Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/213738/dh_128143.pdf accessed 10/04/2013 2013.

121. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology* 2006;3(2):77-101. doi: 10.1191/1478088706qp063oa

122. Jane R, Liz S. Qualitative Data Analysis for Applied Policy Research. The Qualitative Researcher's Companion. . Thousand Oaks, CA: SAGE Publications, Inc. 2002.

123. Doolan M, Beckett C, O'Brien J, Scott S. Strategies for engaging and keeping families in research studies: Key lessons from the Helping Children Acheive Trial Department for Education 2010 [Available from: http://dera.ioe.ac.uk/13824/1/DFE-RR185c.pdf.

124. Carson V, Clark M, Berry T, Holt N, Latimer-Cheung A. A qualitative examination of the perceptions of parents on the Canadian Sedentary Behaviour Guidelines for the early years. *International Journal of Behavioral Nutrition and Physical Activity* 2014;11(1):65.

125. Dwyer GM, Higgs J, Hardy LL, Baur LA. What do parents and preschool staff tell us about young children's physical activity: a qualitative study. *International Journal of Behavioral Nutrition and Physical Activity* 2008;5(66):1479-5868.

126. Kesten JM, Jago R, Sebire SJ, Edwards MJ, Pool L, Zahra J, Thompson JL. Understanding the Accuracy of Parental Perceptions of Child Physical Activity: A Mixed Methods Analysis. *Journal of physical activity & health* 2015 doi: 10.1123/jpah.2014-0442

127. De Decker E, De Craemer M, De Bourdeaudhuij I, Wijndaele K, Duvinage K, Koletzko B, Grammatikaki E, Iotova V, Usheva N, Fernandez-Alvira J, Zych K, Manios Y, Cardon G. Influencing factors of screen time in preschool children: an exploration of parents' perceptions through focus groups in six European countries. *Obesity Reviews* 2012;13(Suppl 1):75 - 84.

128. He M, Irwin J, Sangster Bouck L, Tucker P, Pollett G. Screen-viewing behaviors among preschoolers parents' perceptions. *American Journal of Preventative Medicine* 2005;29(2):120 - 25.

129. Hesketh K, Hinkley T, Campbell K. Children's physical activity and screen time: qualitative comparison of views of parents of infants and preschool children. *International Journal of Behavioral Nutrition and Physical Activity* 2012;9:152.

130. Knowles A-M, Kirk AF, Hughes AR. Parents' perceptions of their children's sedentary behaviour. *Qualitative Research in Sport, Exercise and Health* 2015:1-17. doi: 10.1080/2159676X.2015.1008026

131. Education.com. I. 8 Great iPad Apps for Preschoolers [Available from: http://www.education.com/slideshow/ipad-apps-preschool accessed 07/07/2015.

132. Netmums. Top educational apps [Available from: http://www.netmums.com/activities/g/top-ten-educational-apps accessed 7th July 2015.

133. Flewitt R, Messer D, Kucirkova N. New directions for early literacy in a digital age: The iPad. *Journal of Early Childhood Literacy* 2014;15(3) doi: 10.1177/1468798414533560

134. Neumann MM. An examination of touch screen tablets and emergent literacy in Australian pre-school children. *Australian Journal of Education* 2014;58(2):109-22. doi: 10.1177/0004944114523368

135. Birken CS, Maguire J, Mekky M, Manlhiot C, Beck CE, Jacobson S, Peer M, Taylor C, McCrindle BW, Parkin PC. Parental factors associated with screen time in pre-school children in primary-care practice: a TARGet Kids! study. *Public Health Nutr* 2011;14(12):2134-8. doi: 10.1017/s1368980011000516 [published Online First: 2011/04/07]

136. He M, Irwin JD, Sangster Bouck LM, Tucker P, Pollett GL. Screen-Viewing Behaviors Among Preschoolers: Parents' Perceptions. *American Journal of Preventive Medicine* 2005;29(2):120-25. doi: http://dx.doi.org/10.1016/j.amepre.2005.04.004

137. Walton K, Simpson JR, Darlington G, Haines J. Parenting stress: a cross-sectional analysis of associations with childhood obesity, physical activity, and TV viewing. *BMC Pediatr* 2014;14:244. doi: 10.1186/1471-2431-14-244 [published Online First: 2014/10/02]

138. Evans CA, Jordan AB, Horner J. Only Two Hours?: A Qualitative Study of the Challenges Parents Perceive in Restricting Child Television Time. *Journal of Family Issues* 2011;32(9):1223-44. doi: 10.1177/0192513x11400558

139. Latimer A, Brawley L, Bassett R. A systematic review of three approaches for constructing physical activity messages: what messages work and what improvements are needed? *International Journal of Behavioral Nutrition and Physical Activity* 2010;7:36.

140. Australian Government, Department of Health. Move and play every day. National physical activity recommendations for children 0-5 years 2014 [Available from: http://www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines#npa05 accessed 15 January 2015.

141. Tremblay M, Leblanc A, Carson V, Choquette L, Connor Gorber S, Dillman C, Duggan M, Gordon M, Hicks A, Janssen I, Kho M, Latimer A, LeBlanc C, Murumets K, Okely A, Reilly J, Spence J, Stearns J, Timmons B. Canadian physical activity guidelines for the early years (aged 0-4 years). *Applied Physiology, Nutrion andMetababolism* 2012;37(2):345 - 69.

142. NHS Choices. Physical activity guidelines for children (under five years) 2015 [Available from: http://www.nhs.uk/Livewell/fitness/Pages/physical-activity-guidelines-for-children.aspx accessed January 2016 2016.

143. BHF National Centre for Physical Activity and Health. Early Years: Resources and Publication [Available from: http://www.bhfactive.org.uk/early-years-resources-and-publications/index.html accessed January 2016.

144. NPEU. NPEU Tools: IMD tool University of Oxford [Available from: https://tools.npeu.ox.ac.uk/imd/ accessed 05/06/2018.

145. Delbecq A, Van De Ven AH, Gustafson DH. Group Techniques for Program Planning. USA: Scott, Foresmann and Company 1975.

146. Delbecq AL, Van de Ven AH. A Group Process Model for Problem Identification and Program Planning. *The Journal of Applied Behavioral Science* 1971;7(4):466-92. doi: 10.1177/002188637100700404

147. Harvey N, Holmes CA. Nominal group technique: An effective method for obtaining group consensus. *International Journal of Nursing Practice* 2012;18(2):188-94. doi: 10.1111/j.1440-172X.2012.02017.x

148. McMurray A. Three decision-making aids: Brainstorming, nominal group, and Delphi technique. *Journal of Nursing Staff Development* 1994;10(2):62-5.

149. Aspinal F, Hughes R, Dunckley M, Addington-Hall J. What is important to measure in the last months and weeks of life?: A modified nominal group study. *International Journal of Nursing Studies* 2006;43(4):393-403. doi: http://dx.doi.org/10.1016/j.ijnurstu.2005.06.005

150. Corner J, Wright D, Hopkinson J, Gunaratnam Y, McDonald JW, Foster C. The research priorities of patients attending UK cancer treatment centres: findings from a modified nominal group study. *British Journal of Cancer* 2007;96(6):875-81.

151. Iliffe S, Wilcock J. The identification of barriers to the recognition of, and response to, dementia in primary care using a modified focus group approach. *Dementia* 2005;4(1):73-85. doi: 10.1177/1471301205049191

152. McMillan SS, Kelly F, Sav A, Kendall E, King MA, Whitty JA, Wheeler AJ. Using the Nominal Group Technique: how to analyse across multiple groups. *Health Services and Outcomes Research Methodology* 2014;14(3):92-108. doi: 10.1007/s10742-014-0121-1

153. Robinson VA, Hunter D, Shortt SED. Accountability in Public Health Units: Using a Modified Nominal Group Technique to Develop a Balanced Scorecard for Performance Measurement. *Canadian Journal of Public Health / Revue Canadienne de Sante'e Publique* 2003;94(5):391-96.

154. Colville A. Creating a shared vision that works UX Magazine 2012 [Available from: https://uxmag.com/articles/creating-a-shared-vision-that-works accessed 10/10/2016.

155. French M. Personal communication: Modification of nominal group technique used by UX consultants 3Sixty Digital Ltd. , 2016.

156. Creswell JW. Qualitative Inquiry and Research Design: Choosing Among Five Approaches: SAGE Publications 2013.

157. Latimer-Cheung A, Rhodes R, Kho M, Tomasone J, Gainforth H, Kowalski K, Nasuti G, Perrier M, Duggan M, W CPAGMR. Evidence-informed recommendations for constructing and disseminating messages supplementing the new Canadian physical activity guidelines. *BMC Public Health* 2013;13:419.

158. Korda H, Itani Z. Harnessing Social Media for Health Promotion and Behavior Change. *Health Promotion Practice* 2013;14(1):15-23. doi: 10.1177/1524839911405850

159. Department of Health. Factsheet 2: Physical activity guidelines for early years (under 5s) - for children who are capable of walking 2011 [Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/213738/dh_128143.pdf accessed 01/02/2012.

160. Smith B. Generalizability in qualitative research: misunderstandings, opportunities and recommendations for the sport and exercise sciences. *Qualitative Research in Sport, Exercise and Health* 2018;10(1):137-49. doi: 10.1080/2159676X.2017.1393221

161. Hunter RF, Tully MA, Donnelly P, Stevenson M, Kee F. Knowledge of UK physical activity guidelines: Implications for better targeted health promotion. *Preventive Medicine* 2014;65(0):33-39. doi: http://dx.doi.org/10.1016/j.ypmed.2014.04.016

162. Knox ECL, Esliger DW, Biddle SJH, Sherar LB. Lack of knowledge of physical activity guidelines: can physical activity promotion campaigns do better? *BMJ Open* 2013;3(12) doi: 10.1136/bmjopen-2013-003633

163. Well NL. Vinnie Jones: Hard and Fast - hands-only CPR: NHS Live Well 2015 [updated 14/07/2016. Available from: https://www.nhs.uk/video/Pages/vinnie-jones-how-to-perform-cpr.aspx accessed 05/09/2016.

164. Faulkner G, White L, Riazi N, Latimer-Cheung AE, Tremblay MS. Canadian 24-Hour Movement Guidelines for Children and Youth: Exploring the perceptions of stakeholders regarding their acceptability, barriers to uptake, and dissemination. *Applied Physiology, Nutrition, and Metabolism* 2016;41(6 (Suppl. 3)):S303-S10. doi: 10.1139/apnm-2016-0100

165. Laverack G. The Challenge of Behaviour Change and Health Promotion. *Challenges* 2017;8(2):25.

166. Tengland PA. Behavior Change or Empowerment: On the Ethics of Health-Promotion Goals. *Health care analysis : journal of health philosophy and policy* 2016;24(1):24-46. doi: 10.1007/s10728-013-0265-0 [published Online First: 2013/10/09]

167. Berry TR, Witcher C, Holt NL, Plotnikoff RC. A qualitative examination of perceptions of physical activity guidelines and preferences for format. *Health Promotion Practice* 2010;11(6):908-16. doi: 10.1177/1524839908325066 [published Online First: 2009/01/01]

168. Kreuter MW, Wray RJ. Tailored and Targeted Health Communication: Strategies for Enhancing Information Relevance. *American Journal of Health Behavior* 2003;27(1):S227-S32.

169. Carey GE, Braunack-Mayer AJ. Exploring the effects of government funding on community-based organizations: 'top-down' or 'bottom-up' approaches to health promotion? *Glob Health Promot* 2009;16(3):45-52. doi: 10.1177/1757975909339765 [published Online First: 2009/09/24]

170. Fox S. The Social Life of Health Information: Pew Research Center; 2011 [Available from: http://www.pewinternet.org/2011/05/12/the-social-life-of-health-information-2011/ accessed 20/08/2018.

171. Lupton D. Health promotion in the digital era: a critical commentary. *Health Promotion International* 2015;30(1):174-83. doi: 10.1093/heapro/dau091

172. Gupta RS, Shuman S, Taveras EM, Kulldorff M, Finkelstein JA. Opportunities for Health Promotion Education in Child Care. *Pediatrics* 2005;116(4):e499-e505. doi: 10.1542/peds.2005-0467

173. Brownson RC, Eyler AA, Harris JK, Moore JB, Tabak RG. Getting the Word Out: New Approaches for Disseminating Public Health Science. *Journal of Public Health Management and Practice* 2018;24(2):102-11. doi: 10.1097/phh.0000000000000673

174. Ball R, Duncanson K, Burrows T, Collins C. Experiences of Parent Peer Nutrition Educators Sharing Child Feeding and Nutrition Information. *Children* 2017;4(9):78. doi: 10.3390/children4090078

175. Harris JK, Moreland-Russell S, Tabak RG, Ruhr LR, Maier RC. Who says what to whom about #childhoodobesity on Twitter. *American journal of public health* 2014;104(7):e62-e69. doi: 10.2105/AJPH.2013.301860

176. Welch V, Petkovic J, Pardo JP, Rader T, Tugwell P. Interactive social media interventions to promote health equity: an overview of reviews. *Health Promotion and Chronic Disease Prevention in Canada : Research, Policy and Practice* 2016;36(4):63-75.

177. Borra ST, Kelly L, Shirreffs MB, Neville K, Geiger CJ. Developing health messages: Qualitative studies with children, parents, and teachers help identify communications opportunities for healthful lifestyles and the prevention of obesity. *Journal of the American Dietetic Association* 2003;103(6):721-28. doi: https://doi.org/10.1053/jada.2003.50140

178. Morahan-Martin DJM. How Internet Users Find, Evaluate, and Use Online Health Information: A Cross-Cultural Review. *CyberPsychology & Behavior* 2004;7(5):497-510. doi: 10.1089/cpb.2004.7.497

179. Noar SM. A 10-Year Retrospective of Research in Health Mass Media Campaigns: Where Do We Go From Here? *Journal of Health Communication* 2006;11(1):21-42. doi: 10.1080/10810730500461059

180. Townsend N WK, Williams J, Bhatnagar P, Rayner M. Physical Activity Statistics 2015. London: British Heart Foundation 2015.

181. Trigwell J, Murphy RC, Cable NT, Stratton G, Watson PM. Parental views of children's physical activity: a qualitative study with parents from multi-ethnic backgrounds living in England. *BMC Public Health* 2015;15(1):1005. doi: 10.1186/s12889-015-2351-8

182. Davison KK, Gicevic S, Aftosmes-Tobio A, Ganter C, Simon CL, Newlan S, Manganello JA. Fathers' Representation in Observational Studies on Parenting and Childhood Obesity: A Systematic Review and Content Analysis. *American journal of public health* 2016;106(11):e14-e21. doi: 10.2105/ajph.2016.303391 [published Online First: 2016/09/16]

183. Office for National Statistics. Families and Households: 2017 2018 [Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2017 accessed 9/08/2018.

184. Campbell KJ, Hesketh KD. Strategies which aim to positively impact on weight, physical activity, diet and sedentary behaviours in children from zero to five years. A systematic review of the literature. *Obesity Reviews* 2007;8(4):327-38.

185. Ruiz RM, Sommer EC, Tracy D, Banda JA, Economos CD, JaKa MM, Evenson KR, Buchowski MS, Barkin SL. Novel patterns of physical activity in a large sample of preschool-aged children. *BMC Public Health* 2018;18(1):242. doi: 10.1186/s12889-018-5135-0

186. Hinkley T, McCann JR. Mothers' and father's perceptions of the risks and benefits of screen time and physical activity during early childhood: a qualitative study. *BMC Public Health* 2018;18(1):1271. doi: 10.1186/s12889-018-6199-6

187. NHS. Physical activity guidelines for children (under 5 years) NHS Live Well2018 [Available from: https://www.nhs.uk/live-well/exercise/physical-activity-guidelines-children-under-five-years/ accessed 03/11/2018 2018.

188. Start4Life. Activities for toddlers: Public Health England [Available from: https://www.nhs.uk/start4life/toddler/activities/ accessed 19/11/2018.

189. Department of Health. Start active, stay active: infographics on physical activity 2016 [Available from: https://www.gov.uk/government/publications/start-active-stay-active-infographics-on-physical-activity accessed 01/05/2018.

190. Reid H, Davies S, Calderwood C, Atherton F, McBride M, Foster C. Infographic. Physical activity for early years. *British Journal of Sports Medicine* 2018;52(10):631-32. doi: 10.1136/bjsports-2016-096813 %J British Journal of Sports Medicine

191. Downing KL, Hnatiuk JA, Hinkley T, Salmon J, Hesketh KD. Interventions to reduce sedentary behaviour in 0–5-year-olds: a systematic review and meta-analysis of randomised controlled trials. *British Journal of Sports Medicine* 2018;52(5):314-21. doi: 10.1136/bjsports-2016-096634

192. Buckton CH, Lean ME, Combet E. 'Language is the source of misunderstandings'-impact of terminology on public perceptions of health promotion messages. *BMC Public Health* 2015;15:579. doi: 10.1186/s12889-015-1884-1 [published Online First: 2015/06/24]

193. Davison KK, Gicevic S, Aftosmes-Tobio A, Ganter C, Simon CL, Newlan S, Manganello JA. Fathers' Representation in Observational Studies on Parenting and Childhood Obesity: A Systematic Review and Content Analysis. 2016;106(11):e14-e21. doi: 10.2105/ajph.2016.303391

194. Hesketh KR, Lakshman R, Sluijs EMF. Barriers and facilitators to young children's physical activity and sedentary behaviour: a systematic review and synthesis of qualitative literature. *Obesity Reviews* 2017;18(9):987-1017. doi: doi:10.1111/obr.12562

195. Zahra J, Sebire SJ, Jago R. "He's probably more Mr. sport than me" – a qualitative exploration of mothers' perceptions of fathers' role in their children's physical activity. *BMC Pediatr* 2015;15(1):101. doi: 10.1186/s12887-015-0421-9

APPENDICES

Appendix 1

Pre-schoolers' Physical Activity Project

A researcher from the University of Bristol will be at XXX Nursery from 4.30pm on Thursday 2nd May to speak with parents about taking part in the preschoolers physical activity project.

The preschoolers physical activity project aims to find out how active preschool children are and how we can help them to be more active.

The researcher would like to ask parents if they would be interested in helping out with the research project by giving their thoughts and views in a one-to-one interview, at a time and place that suits the parent.

For more information, please contact **Georgina Bentley:**

Tel: 07xxxxxxxx Email: georgina.bentley@bristol.ac.uk

Appendix 2

University of BRISTOL

Preschoolers Physical Activity Project

Parent Information Sheet

I'm inviting you to take part in a research project about preschool children's physical activity. This leaflet explains why I'm doing the research and what it involves. Please take time to read this information, which will help you decide if you wish to take part. Please feel free to ask me if anything is unclear.

What is the project about?

The preschoolers physical activity project is part of my PhD research into how active preschool children are and how we can help them to be more active. Being physically active is important for children's well-being and development. I want to find out the best way to help parents support their children to be physically active from an early age.

Speaking with parents to understand their everyday family lives and experiences is at the heart of my research. I would like to ask you as a parent, about your preschool child's typical day, when they're most active and what may stop them from being active.

I hope to use the information you provide to help shape the next stages of my research which includes developing a questionnaire about preschool children's physical activity and creating strategies which can encourage preschool children to be more active.

What's involved in taking part in the study?

- You will be asked to take part in a one-to-one interview which will last around 45 minutes.
- We will talk about your preschool child's day, what activities they like to do and I will ask your opinions on what helps and prevents children from being active.
- We will arrange the interview at a time and place that is convenient for you.
- The interview will be audio-recorded, I will then type up the interviews and remove your name and any other information identifying you and your children. The audio-recording will then be destroyed.
- Short, direct quotes from your interview may be used in research publications but your name or any identifying information will not be used.

Do I have to take part?
No. Taking part is completely up to you. If you agree to take part and change your mind about any part of the study, at any stage, you are free to withdraw without giving us any reason.

Will information be confidential?
Your involvement in the research and anything you say will be confidential. If however, you tell me something that may indicate that a child is at risk of harm I am obliged to notify the relevant authorities. Information you provide us will be made anonymous and securely stored.

Who has approved the study?
This research has been approved by the University of Bristol Faculty of Medicine and Dentistry Committee for Ethics.

What will happen now?
If you would like to take part in the interview then I will ask you to complete a consent form. We will then arrange a convenient time and place to meet.

How do I get in touch?
Please contact me (Georgina Bentley) if you have any questions. I can be contacted on:
Tel: xxx
Email: xxx

Thank you for your interest in this project!

Georgina Bentley

School of Social and Community Medicine
University of Bristol
Canynge Hall,
39 Whatley Road,
Bristol BS8 2PS

Tel: 0117 xxx
Email: xxx

Appendix 3

Participant ID:

Recruitment Location ID:

School of Social and Community Medicine
University of Bristol
Canynge Hall,
39 Whatley Road,
Bristol BS8 2PS

CONSENT FORM

Preschooler's Physical Activity Project

Please read each statement and initial all box if you agree

1.	I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2.	I understand that my participation in the study involves a one-to-one interview that will last about 45minutes and will be audio-recorded	☐
3.	I consent to be contacted in order to arrange a time and place for the interview.	☐
4.	I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason	☐
5.	I understand that any files containing information about myself and my family will be made anonymous, will be treated as confidential and will be stored on password protected computers	☐
6.	I agree to the University of Bristol recording and processing the information I have contributed. I understand that this information will be used only for the purpose of this study and my consent is conditional upon the University complying with its duties and obligations under the Data Protection Act	☐
7.	I agree to take part in the above study.	☐

Please sign and date here.

Name of parent/guardian	Signature	Date

If you have any questions, please call Georgina on: xxx or email: xxx

Appendix 4

Preschoolers Physical Activity Project
Interview Guide

- Introduce myself, reminder of where we met.
- Remind them what the interview is about and why they have been asked to take part.
- Explain that I'm interested in hearing their views as a parent – there are no right or wrong answers.
- Check they are happy for the interview to be audio-recorded to help me remember what has been said.
- Everything they say will be confidential
- You can ask for the recording to be stopped at any time.
- You can interrupt/stop the interview at any point if you need to.
- If you do not want to answer a question please say so.
- If anything is unclear, please ask me to clarify

- Check they have read the information sheet and signed consent form

- Check if the participant has any questions

- *Are you ok to go ahead now?*

If the parent says yes the interview will start.

---

1. Please can you tell me a bit about **yourself and your family**?

   Probe: who lives with you, what ages are your children, do you and your partner work, what sorts of things do you do together as a family?)

2. And can you tell me a bit about this **area**. For example, what the area is like, what sort of facilities you have in your area for preschool children?

   Do you know many **other mums** with children of the same age in this area?

3. So thinking **about your preschool child**, tell me a bit about him/her - What do they like doing?

What **type of play** does your child have a preference for? (E.g. crafts, rough and tumble, imaginary play, watching TV or DVDs?)

4. Can you talk me through a **typical week** for [child's name]?

5. How do you generally **travel** around with your preschool child? (E.g. car, public transport, walking etc).

   Does [child's name] use a pushchair?

   How do you travel when going to… (places parent has mentioned they regularly go to)

   What factors influence how you choose to get somewhere? (E.g. shopping to carry, time, distance, weather)

   How far/long is [child's name] happy to walk for?

I'd like to talk a bit about [child's name]'s **physical activity**. Physical activity can be structured exercise such as gymnastics, sport or swimming classes, or just walking to the shops or playing the garden – it's anything that gets the body moving.

6. Which days do you think [child's name] is most **physically active**?

7. Do you ever **encourage** [child's name] to be more active?

   Probe: How/why?

8. Do you ever consider whether [child's name] is **getting enough physical activity**?

9. Do you ever encourage [child's name] to **rest or relax**?

   Probe: How/why?

10. What do you think about the **TV** as an activity for preschool children?
    Probe: The types of programmes they watch? How long they watch it for? Who with?
    What are the pros and cons of watching TV?

11. Does [child's name] play with/use any **electronic media devices** such as computers, laptops, iPad, smartphones, games consoles, Wii?

    What are your views on these devices for preschool children?
    Any pros and cons?

12. Have you heard of the **government recommendations for physical activity** and sedentary behaviour for children under 5 years?

    - **Present participant with the DH factsheet**

13. They suggest children under 5 years should be physically active for at least 3 hours spread over the day. What do you think about this?

14. Is there anything you can think of that **parents could do to help** their preschool child reach these recommendations?

    If you set out to increase [child's name]'s PA, what impact do you think that would have?

15. The guidelines also **recommend that sedentary time is reduced**. *Sedentary behaviour can be any activity which takes place sitting or lying down and requires very little energy. For preschool children this may be time spent doing crafts, reading, cuddles or watching TV.* What do you think about this?

    Is there anything you can think of that **parents could do to help** their preschool child reduce their time being sedentary?

    If you set out to decrease [child's name]'s sedentary behaviour what impact do you think that would have?

16. **What do you think about these guidelines?**

17. To what extent do you think **parents can influence** how active their children are?

CLOSING

1. Is there anything else you'd like to tell me about the things we talked about today?
2. Do you have any questions?
3. Thank you very much for your time. I appreciate you sharing your thoughts and opinions with me.

Appendix 5

FACTSHEET 2

Physical activity guidelines for

EARLY YEARS (UNDER 5s) – FOR CHILDREN WHO ARE CAPABLE OF WALKING

1. Children of pre-school age who are capable of walking unaided should be physically active daily for at least 180 minutes (3 hours), spread throughout the day.*
2. All under 5s should minimise the amount of time spent being sedentary (being restrained or sitting) for extended periods (except time spent sleeping).

* Most UK pre-school children currently spend 120–150 minutes a day in physical activity, so achieving this guideline would mean adding another 30–60 minutes per day.

Individual physical and mental capabilities should be considered when interpreting the guidelines.

Examples of physical activity that meet the guidelines

Physical activity is likely to occur mainly through unstructured active play but may also include more structured activities. Activities can be of any intensity (light or more energetic) and may include:

- Activities which involve movements of all the major muscle groups, i.e. the legs, buttocks, shoulders and arms, and movement of the trunk from one place to another
- Energetic play, e.g. climbing frame or riding a bike
- More energetic bouts of activity, e.g. running and chasing games
- Walking/skipping to shops, a friend's home, a park or to and from a school

Minimising sedentary behaviour may include:

- Reducing time spent watching TV, using the computer or playing video games
- Reducing time spent in a pushchair or car seat – this can also help to break up long periods of sedentary behaviour

What are the benefits of being active for at least 180 minutes each day?

- Improves cardiovascular health
- Contributes to a healthy weight
- Improves bone health
- Supports learning of social skills
- Develops movement and co-ordination

For further information: *Start Active, Stay Active: A report on physical activity for health from the four home countries' Chief Medical Officers* (2011)

DHSSPS Department of Health, Social Services and Public Safety

The Scottish Government

Llywodraeth Cymru Welsh Government

DH Department of Health

Appendix 6

	Code	*Description*
Context		
1	Family context	*Details about the family living situation e.g. who lives within their family, work, routines, and general family life*
Child		
2	Child's details	*Descriptions of the child's personal details, personality and behaviour,*
3	Child's routine	*Their daily/weekly routine*
4	Child's development	*Relating to child's developmental stage (mental, physical and emotional)*
Parent		
6	General parenting style	*How they parent, e.g. manage behaviour, what they value and feel is important for their children etc.*
7	Parent's PA/SV	*What PA/SB/SV they does the parent do for themselves*
8	Role modelling PA/SB/SV	*What PA/SB/SV they do to encourage/discourage their child*
9	Control of time/behaviour/energy	*How parents manage and control their child's time and actions to balance their energy and behaviour*
10	Attitudes towards PA	*Parents' thoughts and attitudes about the value of PA*
11	Attitudes towards SB	*Parents' thoughts and attitudes about the value of SB*
12	Attitudes towards SV	*Parents' thoughts and attitudes about the value of SV*
13	Perceived need to increase PA	*Parents' perceived need to increase PA in their child - is it necessary for their child and how could they do it*
14	Perceived need to decrease SB	*Parents' perceived need to decrease SB in their child - is it necessary for their child and how could they do it*

Physical Activity		
15	Activity levels	*Descriptions of their child's activity levels*
16	Active days	*Which days are the most active and why*
17	Type and frequency of activity	*What activities does the child do, for how long and how often*
17a	Non-active play	*Crafts, puzzles, board games, dressing-up*
17b	Active play	*Climbing, playing in garden, park, riding a bike*
17c	Structured activities	*Swimming lessons, toddler groups, soft play*
17d	Travel	*Scooting, walking, cycling*
17e	General comments	*Going to friends house, playing at home, playing with siblings*
17f	Other	*Helping with chores, family days out*
18	Reasons for PA	*Why does the child do a specific activity*
19	Factors that influence PA	*Factors that may influence/alter the child's PA*
20	Barriers to PA	*Factors that make PA difficult for the child*
21	Child's engagement / enjoyment of PA	*The child's reaction to PAs*
22	Parents strategies to increase PA	*What do the parents currently do that facilitates PA in their child*
23	The effects of PA on child	*How does PA effect the child (e.g. energy levels, behaviour)*

Sedentary Behaviour (excl. SV)		
24	Types and frequency of SB	*What SV does the child do, for how long and how often (e.g. pushchair, car, reading, napping)*
25	Reasons for SB	*Why does the child do a specific SB (exl. SV) e.g. car travel, pushchair*
Screen Viewing Behaviour		
26	Time spent SV	*How long does the child SV for*
27	Structure in the day	*How SV is carried out within the day*
28	Reasons for SV use	*Why does the child do SV*
29	Devices (lack of devices and access to devices)	*What SV devices does the child have access to or lack of devices in the house*
30	Content	*What does the child watch/play when SV*
31	Child's SV skills (touch screen / mouse etc.)	*Skills and lack of skills that enable SV (e.g. mouse control)*
32	Rules and limits	*Rules that the parents has put in place to control SV*
33	Factors that influence SV	*Factors that may influence/alter/impact on the child's SV*
34	Replacement (what would they be doing instead)	*If the child wasn't SV what would they be doing instead*
35	Child's engagement/reaction with SV	*The child's reaction to SV*
36	The effect of SV on child	*How does SV effect the child (e.g. energy, behaviour)*

37	Parent's justification for SV	*Why parents think SV for their child is ok/not ok*
38	Strategies to reduce SV	*What do the parents currently do that helps limit SV time*
39	Alternatives to SV for downtime	*What else do their children do to relax/have quiet time that is not SV*
Siblings		
40	Direct	*The direct effect of the child's sibling on their PA or SV e.g. playmate, role model*
41	Indirect	*The indirect effect of the child's sibling on their PA or SV e.g. the effect on parent time, social networks*
42	Siblings PA	*What PA does their sibling do?*
43	Siblings SV	*What SV does their sibling do?*
Childcare		
44	The impact of childcare on PA/SB	*How the parent thinks nursery/preschool affects their child's PA/SB*
Local area		
45	General	*General description of their local area including community*
46	Formal facilities	*Facilities and groups specifically for preschool children in the local area e.g. play groups, swimming classes*
47	Informal facilities	*Facilities that preschool children can access in the local area e.g. green space, woodlands, parks*
Social support		
48	For the child	*Friends and social groups in the area for the child*
49	For the mum	*Friends, family and social groups in the area for the mum*
UK PA recommendations		

50	Knowledge of recommendations	*What do the parent's know about government PA recommendations for children*
51	Reaction to PA recommendations	*Parents reaction to the preschool PA recommendations*
52	Reaction to SB recommendations	*Parents reaction to the preschool SB recommendations*
Other		
53	Child's self-management of energy levels	*How the child manages their own energy (e.g. resting/quiet play when tired)*
54	Gender typing	*Parents descriptions of their child that relates to their gender (e.g. typical boy is boisterous)*
55	School ready – Training	*Parents desire for their child being ready to start school e.g. using computer/mouse, knowing numbers*
56	Tensions	*Tensions that appear in the family relating to PA or SV (e.g. parents' want to go out children don't)*
57	Local investment in PA facilities	*New playground facilities in the area*
58	Resources of PA/SB/SV	*Families recourses that may facilitate PA/SB/SV e.g. membership, equipment*

Appendix 6

Study 2 Facebook advertisement

Are you a mum or dad of a 3 or 4 year old? If so, I would really value your experiences and opinions.

I'm looking for parents to take part in a focus group as part of my PhD research looking at preschoolers active play. The focus group will be fun, informal, and informative. It will last up to 2 hours and you will have a choice of joining a day, evening or weekend group.

You will receive a £20 Love2Shop voucher for taking part.

If you're interested in finding out more please email me (xxx).
Thank you!

Appendix 7

Participant ID:

Recruitment Location ID:

School of Social and Community Medicine
University of Bristol
Canynge Hall,
39 Whatley Road,
Bristol BS8 2PS

CONSENT FORM

Preschooler's Physical Activity Project

Please read each statement and initial all box if you agree

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation in the study involves taking part in a focus group that will be audio-recorded ☐

3. I consent to be contacted in order to arrange a time and place for the focus group ☐

4. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason ☐

5. I understand that any files containing information about myself and my family will be made anonymous, will be treated as confidential and will be stored on password protected computers ☐

6. I agree to the University of Bristol recording and processing the information I have contributed. I understand that this information will be used only for the purpose of this study and my consent is conditional upon the University complying with its duties and obligations under the Data Protection Act ☐

7. I agree to take part in the above study ☐

Please sign and date here.

Name of parent/guardian	Signature	Date

If you have any questions please call Georgina on

Appendix 8

Preschooler's Physical Activity Project

Parent Information Sheet

I'm inviting you to take part in a research project about preschool children's physical activity. This leaflet explains why I'm doing the research and what it involves. Please take time to read this information, which will help you decide if you wish to take part. Please feel free to ask me if anything is unclear.

What is the project about?
The preschooler's physical activity project is part of my PhD research into how active preschool children are and how we can help them to be more active. Being physically active is important for children's well-being and development. I want to find out the best way to help parents support their children to be physically active from an early age. To do this I would like to gain much needed information on physical activity levels of preschool children and their parents.

What's involved in taking part in the study?
If you agree to take part you will be asked to:

- Wear a matchbox-sized activity monitor for 7 days. It tells us how much activity you do. We will also ask if your preschool child can wear a monitor during the same time.
- Complete a questionnaire about your experiences as a parent, and you and your child's physical activity levels.
- Activity diary

Do I have to take part?
No. Taking part is completely up to you. If you agree to take part and change your mind about any part of the study, at any stage, you are free to withdraw without giving us any reason.

Are there any disadvantages to taking part?
Other than sparing us your time, we do not see any disadvantages in taking part but if there are you can tell me straight away.

Are there any advantages to taking part?
We will provide some feedback on your and your child's physical activity. We will also offer a….

Will information be confidential?
Your involvement in the research and anything you say will be confidential. If however, you tell me something that may indicate that a child is at risk of harm I

am obliged to notify the relevant authorities. Information you provide us will be made anonymous and securely stored.

Who has approved the study?
This research has been approved by the University of Bristol Faculty of Medicine and Dentistry Committee for Ethics.

What will happen now?
If you would like to take part then I will ask you to complete a consent form. Once I know that you are happy to take part and have given your consent we will contact you about the next stage.

How do I get in touch?
Please contact me (Georgina Bentley) if you have any questions. I can be contacted on:
Tel:

Thank you for your interest in this project!

Georgina Bentley

School of Social and Community Medicine
University of Bristol
Canynge Hall,
39 Whatley Road,
Bristol BS8 2PS

Tel:

University of BRISTOL

Appendix 9

Appendix 10

ID:

Group Code:

Preschoolers Physical Activity Project

Parent/Carer Questionnaire

1. Your Gender *(please circle)*: Female Male

2. Your date of birth: _____

3. Your home postcode: _____

4. What is your current employment status? *(please circle)*

Working full time	Working part-time	Full time parent / caregiver	In full time education	Not currently employed

5. How would you describe your ethnic origin?

_____

6. Please list the ages of the children living in your home:

_____

7. What is your relationship with your preschool child? *(please circle)*

Parent	Step-parent	Grandparent	Carer/guardian	Other

8. Your preschool child's date of birth: _____

9. In addition to yourself, what other adults (over 18) live in your home? *(please circle)*

No other adults	Mother/step-mother	Father/step-father	Son/daughter	Other

10. Does your preschool child have any physical or mental impairments that affects their taking part in physical activity or active play? If so, please provide further information here:

NGT Protocol

Parents are asked to bring with them an example of a play activity that their preschool child enjoys at home.

Welcome:

9.30-9.50

- Parents will be welcomed to the group, checked in and given their Love2Shop voucher on arrival.
- They will be asked to write their own name labels and provided with a tea or coffee.
- The facilitators will ensure that parents are introduced to each other (if they do not already know each other) and speak with any parents that are on their own.
- The aim is to make parents feel as welcome and comfortable as possible.

Introductions:

9.50 – 9.55

- GB will give an introduction to the group and explain the objectives and expectations of parents
    - Everything within the group is confidential
    - Respect other opinions
    - No right or wrong answers
    - Housekeeping (toilets, refreshments, breaks etc.)
    - Have fun
- GB to give a background to the research, PA guidelines and terminology.

Task 1. Warm up and ideas generation

9.55 –

- Parents will be asked to discuss their prepared list of activities with the person next to them and think about differences between personalities of their children and types of play children enjoy. Are there any similarities? What activities would both children like to play (if any)? These questions will be displayed on a board to aid discussion.
- They will be then asked to feed this back to the group, also giving their name and their child's age(s).

- GB will aid discussion and ask questions if parent appears nervous talking to the group.
- The facilitator will write each suggestion of a play activity given by parents onto the flipchart.
- GB will summarise the task by highlighting the variety of activities preschoolers enjoy and the similarities and differences between children's play.

Task 2. Exploring physical activity definitions

10.10 –

Task 2 is to ensure the definitions of physical activity intensities are understood by all participants and to gain an understanding of how participants view play activities before ranking them in the next tasks.

I'm going to read out some sentences that describes preschoolers physical activity intensities.

'Still' time are activities carried out sitting or lying, with little or no movement. This type of play should be minimised.
What do you think about this definition? What types of play does it make you think of? What do you think of the word 'calm' instead?

'**Pottering**' involves slow easy movements or standing play, it will make up the majority of preschoolers active play. It is beneficial for fine motor skills that prepare for reading, writing and mathematics as well as gaining independence (e.g. dressing).
What do you think about this definition? What types of play does it make you think of?

'**Huff and puff'** play is energetic play that makes children warm and breathe harder. This type of active play usually occurs in short, spontaneous bouts throughout the day. It is beneficial for strong bones, muscles, heart and lungs, physical development and building physical confidence and control.
What do you think about this definition? What types of play does it make you think of?

- As a group, parents will be asked to sort their play activity ideas (that they discussed in Task 1) under the definitions above. Some activities may fall under more than one definition. Their decisions will be discussed.

BREAK

Task 3: Ideas generation

10.05 – 10.10

- Ask participants to think of play activities that their child could do at home in the following situations:
    - Play activities that hold your preschool child's attention the longest
    - Play activities that are easy to encourage
    - Play activities that require little or no preparation
    - Play activities that require little or no parental supervision

Task 4: Voting

- Give participants coloured stickers
- Ask them to come up to the board and put 3 stickers on their favourite ideas for:
    - Play activities that hold your preschool child's attention the longest
    - Play activities that are easy to encourage
    - Play activities that require little or no preparation
    - Play activities that require little or no parental supervision

10.30-

Task 5: Summary discussion

- Aid discussion about these results.
    - *What would make doing these activities difficult?*
    - *How helpful would it be to have examples and ideas of activities to do at home?*
    - *What support or advice would you like to carry them out?*
    - *How would you like to receive this information?*

10.40 –

Appendix 11

Study 2: Component 2 Step 2a: Physical activity intensity descriptions

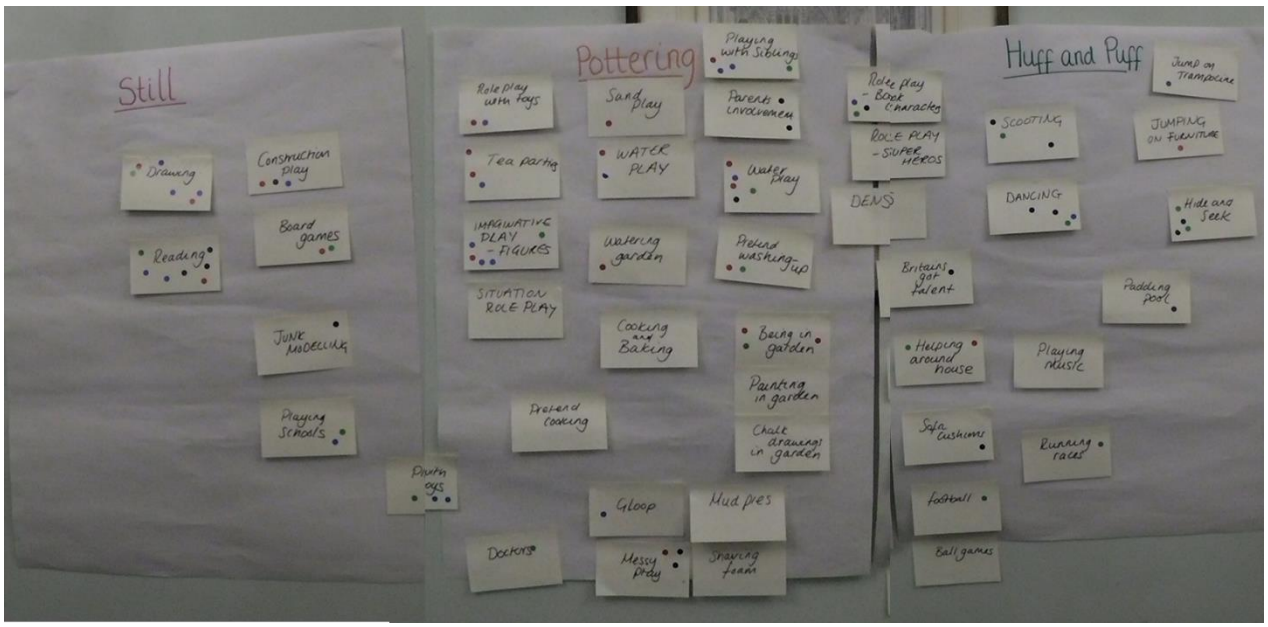
Coding Frame 25/10/2016

	Code	Description
1	Still	
1.1	Still activities	Parents examples of activities they consider 'Still'
1.2	Context of Still	How parents define 'Still', what does Still play look like to them, when, how and why does it occur. What influences it e.g. gender, age, personality,
1.3	Still as a term	Parents opinions about the term 'Still' to describe this intensity. (Positive & Negative)
1.4	Alternatives to Still	Other terms could be used instead of Still, what images do these suggest (e.g. calm, engaged etc.)
1.5	Purpose of Still	Why does this intensity occur e.g. to calm before bed, downtime
2	Pottering	
2.1	Pottering activities	Parents examples of activities they consider 'Pottering'
2.2	Context of Pottering	How parents define 'Pottering', what does Pottering play look like to them, when, how and why does it occur. What influences it e.g. gender, age,
2.3	Pottering as a term	Parents opinions about the term 'Pottering' to describe this intensity (Positive & Negative)
2.4	Alternatives to Pottering	Other terms could be used instead of Pottering, what images do these suggest (e.g. calm, engaged etc.)
2.5	Purpose of Pottering	Why does this intensity occur e.g. child-led play, imaginative play
3	Huff and Puff	
3.1	Huff and Puff activities	Parents examples of activities they consider 'Huff and Puff'
3.2	Context of Huff and Puff	How parents define 'Huff and Puff', what does Huff and Puff play look like to them, when, how and why does it occur. What influences it e.g. gender, age,
3.3	Huff and Puff as a term	Parents opinions about the term 'Huff and Puff' to describe this intensity (Positive & Negative)
3.4	Alternatives to Huff and Puff	Other terms could be used instead of Huff and Puff, what images do these suggest (e.g. calm, engaged etc.)
3.5	Purpose of intensity	Why does this intensity occur e.g. to let off steam
4	Influences of play	Barriers - What factors prevent an activity from occurring / what makes it difficult. What influences how or why play occurs (e.g. siblings, environment)
5	Nature of preschoolers play	How preschoolers play (e.g. sporadic bouts). The reality of PS play vs intensity of term used.
5.1	Duration	The duration of intensities (e.g. still in short periods mixed with pottering or huff & puff)

5.2	Descriptions of child's play	Parents' descriptions of their child's play
5.3	Developmental stages of children	
6	Exercise Vs Play	Parents perceptions of the difference between exercise and play
7	How to categorise PA intensity	Parents views that intensity is on a spectrum and is difficult to categorise. Parents views that an additional term for moderate intensity to bridge Pottering and Huff & Puff is needed.
8	What makes guidelines hard to follow?	E.g. environment, parents' priorities, siblings
9	Perceived need for information	E.g. feelings of living in a nanny state, not relevant, ideas welcomed etc.
10	Modern-day parenting	Culture, parents feelings of pressure from social media / peers, time restraints etc.
11	Parenting styles and beliefs	Parents' confidence in their parenting, child led play vs parent directed , importance of encouraging independence, dealing with the demands of the child
12	Family support	The influence of familial support
13	Dissemination and presentation of guidelines	
13.1	Source of information	E.g. Government initiative, NHS, Children's Centre, peers, parenting websites, social media
13.2	Format of information	E.g. Leaflet, book, app, internet, face to face
13.3	Information content	E.g. Play ideas, more in-depth info on guidelines
13.4	Message communication	E.g. need to be sensitive, flexible, suggestions rather than direction
13.5	Information context	How would the info be used by parents E.g. ideas for when going out or in the home

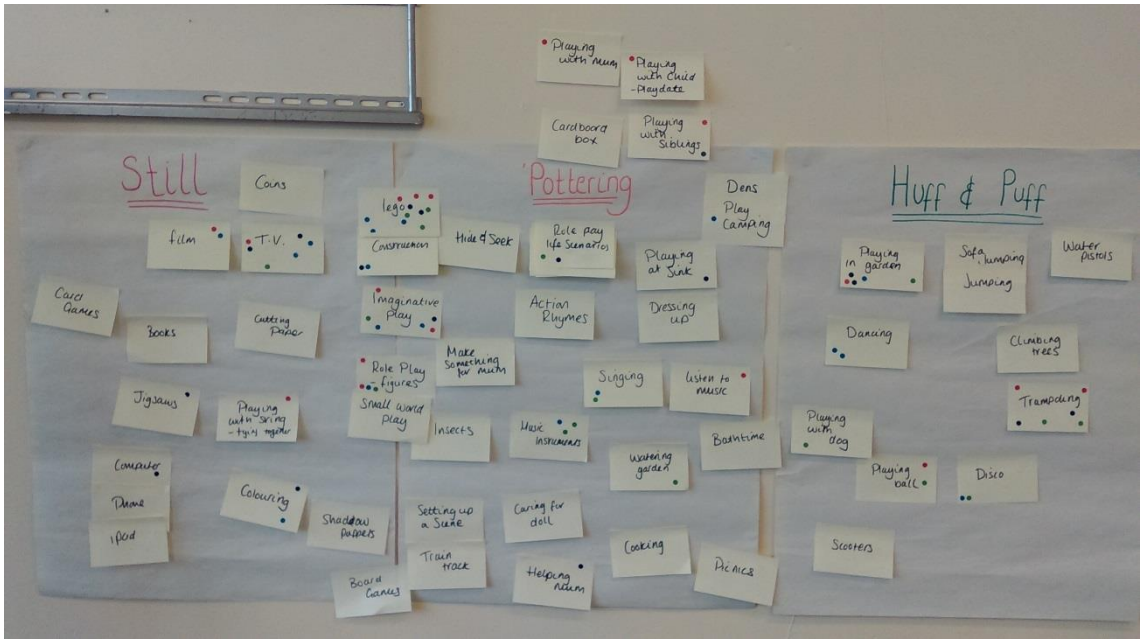
Appendix 12

Group 1



Group 2

Group 3



Group 4

Group 5

Group 6

Appendix 13

Study 3 Facebook advertisement

Are you a parent of a preschool child? Can you help with my research into preschool children's physical activity?

I'm looking for mums and dads to complete a survey as part of my PhD research looking at the physical activity guidelines for preschool children. You will be entered into a prize draw to win **one of two £100 Love2Shop vouchers** once you have completed the survey and entered your contact details.

Click here to take the survey

A big thank you to everyone who takes part!

Georgina

Appendix 14

Preschoolers Physical Activity Project

Page 1: Welcome

University of BRISTOL

This survey is part of a PhD research project looking at the physical activity guidelines for preschool children.

If you are a parent or carer of a child between 2 and 5 years and live in the UK, I am interested in hearing your views. The survey will take between 10 and 15 minutes to complete.

The data collected from this survey is anonymous and will be used for research purposes only. By completing this survey, you are consenting to your answers being used for this PhD research project. Taking part is completely voluntary. There are no right or wrong answers, I'm just interested in your views.

At the end of the survey, you have an option to take part in a **prize draw to win one of two £100 Love2Shop vouchers**. You will be asked for your email address so that I can contact you if you win. Your personal information will not be linked to the answers in your survey and will be strictly confidential.

If you have any questions, please get in touch: georgina.bentley@bristol.ac.uk

Thank you for participating.

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Page 2: About you

1. Please select your gender ✱ *Required*

- ○ Female
- ○ Male

2. What is your age? ✱ *Required*

3. What is your home postcode? E.g. AB12 3CD *This will be used for demographic purposes only.*

4. What is your current employment status? ✱ *Required*

- ○ Working full time
- ○ Working part time
- ○ Full time parent / caregiver
- ○ Student
- ○ Maternity / adoption leave
- ○ Not currently employed

5. What is the highest education in the household? * *Required*

- Did not complete secondary school
- GCSE / GNVQ or equivalent (e.g. O levels / CSE's)
- A levels / advanced GNVQ or equivalent
- Degree (e.g. BA, BSc)
- Postgraduate degree or higher (MSc, MA, PhD, PGCE)
- Apprenticeship
- Professional qualifications (e.g. nursing, teaching, accountancy)
- Other vocational/work related qualifications

6. How would you describe your ethnic origin? * *Required*

- WHITE English/Welsh/Scottish/Northern Irish/British Irish
- WHITE Irish
- WHITE European
- WHITE Gypsy or Irish Traveller
- WHITE Any other white background
- MIXED / MULTIPLE ETHNIC GROUPS White and Black Caribbean
- MIXED / MULTIPLE ETHNIC GROUPS White and Black African
- MIXED / MULTIPLE ETHNIC GROUPS White and Asian
- MIXED / MULTIPLE ETHNIC GROUPS Any other mixed ethnic background
- ASIAN / ASIAN BRITISH Indian
- ASIAN / ASIAN BRITISH Pakistani
- ASIAN / ASIAN BRITISH Bangladeshi
- ASIAN / ASIAN BRITISH Chinese
- ASIAN / ASIAN BRITISH Any other Asian background
- BLACK / AFRICAN / CARIBBEAN / BLACK BRITISH African
- BLACK / AFRICAN / CARIBBEAN / BLACK BRITISH Caribbean
- BLACK / AFRICAN / CARIBBEAN / BLACK BRITISH Any other Black / African /

Caribbean background

Other

6.a. If you selected Other, please specify:

Page 3: About your family

7. Please list the ages of all the children (under 18 years) living in your home

	Child age in years
Child 1	Please select
Child 2	Please select
Child 3	Please select
Child 4	Please select
Child 5	Please select
Child 6	Please select
Child 7	Please select
Child 8	Please select
Child 9	Please select
Child 10	Please select

8. In addition to yourself, what other adults (over 18) live in your home? Check all that apply * *Required*

- ☐ No other adults
- ☐ Your husband / wife / partner
- ☐ Your son / daughter/ step-son / step-daughter
- ☐ Your mother or father
- ☐ Your partner's mother or father
- ☐ Relation-other
- ☐ Paid carer / nanny
- ☐ Unrelated

If you have more than one child between 2 and 5 years, please just choose one child to answer the following questions.

9. How old is your preschool child? ✱ *Required*

10. What is the gender of your preschool child? ✱ *Required*

11. What is your relationship with your preschool child? ✱ *Required*

12. Does your preschool child have any physical or mental health conditions that affects them taking part in physical activity? ✱ *Required*

Page 4: Preschoolers physical activity guidelines

13. The current UK guidelines recomend that **children under the age of 5 years should do at least 3 hours of physical activity throughout the day, everyday**. Do you feel that your preschool child achieves these recommendations? *Required

- Never
- Rarely
- Some days
- Most days
- Every day
- Don't know

Page 5: Physical activity intensity

You are going to be presented with four statements to describe different levels of physical activity intensity for preschool children. The next set of questions will ask about your views on these statements.

Physical activity intensity is howmuch physical effort is required to carry out an activity. For example, sedentary activities such as reading require very little or no physical effort and vigorous intensity activities such as fast running require maximun effort.

Sedentary activity

Still activities are carried out sitting or lying down, with little or no movement

---

Low intensity activity

Pottering involves slow easy movements or standing play

Moderate intensity activity

On the Go is energetic play that make children warm and breathe faster but are still able to talk

---

Vigorous intensity activity

Huff and Puff is high energy play that makes children feel hot and breathe hard and fast

---

Page 6: STILL

'Still' activities are carried out sitting or lying, with little or no movement

14. Do you feel that **'Still'** is a suitable term to use for **sedentary** activity? ✱ *Required*

- ○ Yes
- ○ No
- ○ Don't know

14.a. If you answered NO - do you have any comments why you do not feel that Still is not a suitable term for sedentary activity? *Optional*

15. Do you have a suggestion of an alternative term to Still?

16. What do you think about the description of 'Still' as a term for sedentary activity? **Still activities are carried out sitting or lying, with little or no movement** ✱ *Required*

- ○ Not very clear description
- ○ An adequate description
- ○ A very clear description

17. Please choose **three** activities that you feel would be examples of a **Still** activity for your preschool child. Choose the three Still activities that your child does the most often. Not all the activities in this list will be Still (sedentary) but there are no right or wrong answers.
*Required

- ☐ Board games
- ☐ Construction play (e.g. Lego, building blocks, magformers)
- ☐ Cooking and baking
- ☐ Crafts and junk modelling
- ☐ Drawing and painting
- ☐ Dressing up
- ☐ Helping around the house or garden (watering, cleaning etc.)
- ☐ Hide and seek
- ☐ Listening to audio books
- ☐ Making dens
- ☐ Making music
- ☐ Messy play
- ☐ Obstacle courses
- ☐ Playing in the garden
- ☐ Playing on the furniture (e.g. jumping on the sofa or bed)
- ☐ Playing with a dog
- ☐ Playing with bubbles or balloons
- ☐ Puzzles and jigsaw puzzles
- ☐ Reading
- ☐ Role play (e.g. acting out characters or scenarios)
- ☐ Sand play and water play
- ☐ Singing and action rhymes

- [ ] Small world play (e.g. playing with dolls and figure, cars or farm animals)
- [ ] Stickers
- [ ] Using a tablet or smart phone
- [ ] Watching television
- [ ] Other

17.a. If you selected Other, please specify:

Page 7: POTTERING

'Pottering' involves slow easy movements or standing play

18. Do you feel that **'Pottering'** is a suitable term to use for **low intensity** activity? * *Required*

- Yes
- No
- Don't know

18.a. If you answered NO - do you have any comments why you do not feel that Pottering is not a suitable term for low intensity activity?

19. Do you have a suggestion of an alternative term to Pottering?

20. What do you think about the description of 'Pottering' for low intensity activity? **Pottering involves slow easy movements or standing play** * *Required*

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- ○ Not a very clear description
- ○ An adequate description
- ○ A very clear description

21. Please choose **three** activities that you feel would be examples of a **Pottering** activity for your preschool child. Choose the three Pottering activities that your child does the most often. Not all the activities in this list will be Pottering (low-intensity) but there are no right or wrong answers. ✱ *Required*

- ☐ Board games
- ☐ Construction play (e.g. Lego, building blocks, magformers)
- ☐ Cooking and baking
- ☐ Crafts and junk modelling
- ☐ Dancing
- ☐ Drawing and painting
- ☐ Dressing up
- ☐ Helping around the house or garden (watering, cleaning etc.)
- ☐ Hide and seek
- ☐ Listening to audio books
- ☐ Making dens
- ☐ Making music
- ☐ Messy play
- ☐ Obstacle courses
- ☐ Playing in the garden
- ☐ Playing on the furniture (e.g. jumping on the sofa or bed)
- ☐ Playing with a dog
- ☐ Playing with bubbles or balloons
- ☐ Puzzles and jigsaw puzzles
- ☐ Reading
- ☐ Role play (e.g. acting out characters or scenarios)
- ☐ Rough and tumble

- [ ] Running and ball games
- [ ] Sand play and water play
- [ ] Scooting and cycling
- [ ] Singing, action rhymes and listening to music
- [ ] Small world play (e.g. playing with dolls and figure, cars or farm animals)
- [ ] Stickers
- [ ] Treasure hunts
- [ ] Using a tablet or smart phone
- [ ] Watching television
- [ ] Other

21.a. If you selected Other, please specify:

You're over half way!

Page 8: ON THE GO

'On the Go' is energetic play that makes children warm and breathe faster but are still able to talk.

22. Do you feel that **'On the Go'** is a suitable term to use for **moderate intensity** activity? ✱ *Required*

- ○ Yes
- ○ No
- ○ Don't know

22.a. If you answered NO - do you have any comments why you do not feel that On the Go is not a suitable term for moderate intesity activity?

23. Do you have a suggestion of an alternative term to On the Go?

24. What do you think about the description of 'On the Go' for moderate intensity activity? **On the Go is energetic play that makes children warm and breathe faster, but still able to talk** ✱ *Required*

- ○ Not very clear description
- ○ An adequate description
- ○ A very clear description

25. Please choose **three** activities that you feel would be examples of an **On the Go** activity for your preschool child. Choose the three On the Go activities that your child does the most often. Not all the activities in this list will be On the Go (moderate intensity) but there are no right or wrong answers. ✱ *Required*

- ☐ Board games
- ☐ Construction play (e.g. Lego, building blocks, magformers)
- ☐ Cooking and baking
- ☐ Crafts and junk modelling
- ☐ Dancing
- ☐ Drawing and painting
- ☐ Dressing up
- ☐ Helping around the house or garden (watering, cleaning etc.)
- ☐ Hide and seek
- ☐ Making dens
- ☐ Making music
- ☐ Messy play
- ☐ Obstacle courses
- ☐ Playing in the garden
- ☐ Playing on the furniture (e.g. jumping on the sofa or bed)
- ☐ Playing with a dog
- ☐ Playing with bubbles or balloons
- ☐ Puzzles and jigsaw puzzles
- ☐ Role play (e.g. acting out characters or scenarios)
- ☐ Rough and tumble
- ☐ Running and ball games
- ☐ Sand play and water play
- ☐ Scooting and cycling

- [ ] Singing, action rhymes and listening to music
- [ ] Small world play (e.g. playing with dolls and figure, cars or farm animals)
- [ ] Stickers
- [ ] Trampolining
- [ ] Treasure hunts
- [ ] Using a tablet or smart phone
- [ ] Watching television
- [ ] Other

25.a. If you selected Other, please specify:

Page 9: HUFF AND PUFF

'Huff and Puff' is high-energy play that makes children feel hot and breathe hard and fast.

26. Do you feel that **'Huff and Puff'** is a suitable term to use for vigorous intensity activity? ✱ *Required*

- ○ Yes
- ○ No
- ○ Don't know

26.a. If you answered NO - do you have any comments why you do not feel that Huff and Puff is not a suitable term for vigorous intensity activity?

27. Do you have a suggestion of an alternative term to Huff and Puff?

28. What do you think about the description of **Huff and Puff** for vigorous intensity activity? **Huff and Puff is high-energy play that makes children feel hot and breathe hard and fast.** ✱ *Required*

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- ○ Not a very clear description
- ○ An adequate description
- ○ A very clear description

29. Please choose **three** activities that you feel would be examples of a **Huff and Puff** activity for your preschool child. Choose the three Huff and Puff activities that your child does the most often. Not all the activities in this list will be Huff and Puff (vigorous intensity) but there are no right or wrong answers. ✱ *Required*

- ☐ Board games
- ☐ Construction play (e.g. Lego, building blocks, magformers)
- ☐ Cooking and baking
- ☐ Crafts and junk modelling
- ☐ Dancing
- ☐ Drawing and painting
- ☐ Dressing up
- ☐ Helping around the house or garden (watering, cleaning etc.)
- ☐ Hide and seek
- ☐ Making dens
- ☐ Making music
- ☐ Messy play
- ☐ Obstacle courses
- ☐ Playing in the garden
- ☐ Playing on the furniture (e.g. jumping on the sofa or bed)
- ☐ Playing with a dog
- ☐ Playing with bubbles or balloons
- ☐ Puzzles and jigsaw puzzles
- ☐ Role play (e.g. acting out characters or scenarios)
- ☐ Rough and tumble
- ☐ Running and ball games
- ☐ Sand play and water play
- ☐ Scooting and cycling

- [ ] Singing, action rhymes and listening to music
- [ ] Small world play (e.g. playing with dolls and figure, cars or farm animals)
- [ ] Stickers
- [ ] Trampolining
- [ ] Treasure hunt
- [ ] Using a tablet or smart phone
- [ ] Watching television
- [ ] Other

29.a. If you selected Other, please specify:

Just three more questions to go!

Page 10: How would you like to hear about physical activity information?

30. What format would be a good way for you to receive physical activity information for your preschool child? ✱ *Required*

	Bad	Okay	Good	Very good
Print - A leaflet or booklet	☐	☐	☐	☐
Online - an information page on a pre-existing website (e.g. NHS, Netmums)	☐	☐	☐	☐
Online - a dedicated website	☐	☐	☐	☐
Online - a short video or podcast	☐	☐	☐	☐
Online - a personalised live question and answer session (Chatbot)	☐	☐	☐	☐
App - an interactive app for mobiles and tablets	☐	☐	☐	☐

31. What information would you find useful? ✱ *Required*

	Not at all useful	Not very useful	Useful	Very useful
Information and examples of what counts as physical activity	☐	☐	☐	☐
Advice on how to know if you child is getting enough physical activity	☐	☐	☐	☐
Advice and ideas on how to help your child be more active	☐	☐	☐	☐
Ideas of play activities to do at home (e.g. rainy day activities)	☐	☐	☐	☐

Tailored advice or ideas specific to your situation (e.g. having a baby as well as a preschooler, not having a garden, financial restraints etc.)	☐	☐	☐	☐
Information on activities and 'what's on' in your local area	☐	☐	☐	☐
A forum where you can share ideas with other parents	☐	☐	☐	☐

32. Where would be a good place for you to receive physical activity information for your preschool child? ✱ *Required*

	Bad	Okay	Good	Very good
Health professional (e.g. health visitor, GP, nurse)	☐	☐	☐	☐
Anti-natal classes	☐	☐	☐	☐
Preschool or nursery	☐	☐	☐	☐
Parent and preschool groups (e.g. stay and play, sing and sign)	☐	☐	☐	☐
Online advertising	☐	☐	☐	☐
Social media (e.g. Facebook, Twitter, Instagram)	☐	☐	☐	☐
Information pages on parenting websites (e.g. Netmums, The Dad Network)	☐	☐	☐	☐
A feature on parenting blogs or vlogs	☐	☐	☐	☐
An email to your personal email address	☐	☐	☐	☐
TV and radio advertising	☐	☐	☐	☐

Advert or feature in a local or national newpaper	☐	☐	☐	☐
Word of mouth / information shared between parents	☐	☐	☐	☐

33. Do you have any comments about the questions asked in this survey?

Page 11: Thank you!

Thank you for taking time to complete this survey. If you would like to be entered into a prize draw to win one of two £100 Love2Shop vouchers please follow this link:

Enter the preschool physical activity project prize draw!

Key for selection options

2 - What is your age?

- Under 18
- 18-20
- 21-25
- 26-30
- 31-35
- 36-40
- 41-45
- 46-50
- 51-55
- 56-60
- 60+

7.1.a - Child age in years

- Under 1
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13

9 - How old is your preschool child?

2 years
3 years
4 years
5 years

10 - What is the gender of your preschool child?

Girl
Boy

11 - What is your relationship with your preschool child?

Parent
Step-parent
Carer / guardian
Grandparent
Other

12 - Does your preschool child have any physical or mental health conditions that affects them taking part in physical activity?

Yes
No

Appendix 15		Do you feel that Still is a suitable term?								What do you think of the description for STILL?							
		Yes		No		Don't know				Not a very clear description		An adequate description		A very clear description			
		n	%	*n*	%	*n*	%	χ^2	P	*n*	%	*n*	%	*n*	%	χ^2	P
Gender	Mother	365	83.0%	50	11.4%	25	5.7%	1.562	0.458	40	9.1%	237	53.9%	163	37.0%	0.462	0.794
	Father	40	85.1%	3	6.4%	4	8.5%			3	6.4%	27	57.4%	17	36.2%		
Age range	Under 18	1	100.0%	0	0.0%	0	0.0%	8.473[a]	0.747	0	0.0%	1	100.0%	0	0.0%	12.183a	0.431
	21-25	5	62.5%	2	25.0%	1	12.5%			0	0.0%	5	62.5%	3	37.5%		
	26-30	40	87.0%	3	6.5%	3	6.5%			3	6.5%	21	45.7%	22	47.8%		
	31-35	133	84.7%	15	9.6%	9	5.7%			12	7.6%	86	54.8%	59	37.6%		
	36-40	164	83.2%	23	11.7%	10	5.1%			19	9.6%	108	54.8%	70	35.5%		
	41-45	51	78.5%	9	13.8%	5	7.7%			6	9.2%	34	52.3%	25	38.5%		
	46-50	9	90.0%	1	10.0%	0	0.0%			2	20.0%	7	70.0%	1	10.0%		
	51-55	2	66.7%	0	0.0%	1	33.3%			1	33.3%	2	66.7%	0	0.0%		
IMD Quintiles Low to high	1st	123	83.1%	17	11.5%	8	5.4%	4.563	0.803	18	12.2%	75	50.7%	55	37.2%	9.275	0.32
	2nd	96	81.4%	14	11.9%	8	6.8%			8	6.8%	66	55.9%	44	37.3%		
	3rd	52	77.6%	11	16.4%	4	6.0%			8	11.9%	40	59.7%	19	28.4%		
	4th	45	84.9%	5	9.4%	3	5.7%			1	1.9%	33	62.3%	19	35.8%		
	5th	42	89.4%	2	4.3%	3	6.4%			4	8.5%	23	48.9%	20	42.6%		
Employment category	Working full time	96	84.2%	14	12.3%	4	3.5%	7.395[a]	0.688	11	9.6%	53	46.5%	50	43.9%	16.872a	0.077
	Working part time	204	83.6%	27	11.1%	13	5.3%			27	11.1%	131	53.7%	86	35.2%		

	Full time parent	58	81.7%	7	9.9%	6	8.5%			1	1.4%	46	64.8%	24	33.8%		
	Student	6	66.7%	2	22.2%	1	11.1%			1	11.1%	5	55.6%	3	33.3%		
	Maternity/adoption leave	36	83.7%	3	7.0%	4	9.3%			3	7.0%	27	62.8%	13	30.2%		
	Not currently employed	5	83.3%	0	0.0%	1	16.7%			0	0.0%	2	33.3%	4	66.7%		
Highest education in household	GCSE / GNVQ	13	76.5%	0	0.0%	4	23.5%	23.783[a]	0.022*	1	5.9%	8	47.1%	8	47.1%	7.617a	0.814
	A levels	38	80.9%	5	10.6%	4	8.5%			3	6.4%	22	46.8%	22	46.8%		
	Degree	130	86.7%	10	6.7%	10	6.7%			12	8.0%	83	55.3%	55	36.7%		
	Postgraduate	152	82.6%	25	13.6%	7	3.8%			19	10.3%	96	52.2%	69	37.5%		
	Apprenticeship	4	80.0%	1	20.0%	0	0.0%			0	0.0%	4	80.0%	1	20.0%		
	Professional qualifications	59	80.8%	12	16.4%	2	2.7%			7	9.6%	45	61.6%	21	28.8%		
	Vocational qualifications	9	81.8%	0	0.0%	2	18.2%			1	9.1%	6	54.5%	4	36.4%		
Ethnic Origin	WHITE British	369	83.3%	48	10.8%	26	5.9%	10.821[a]	0.99	38	8.6%	243	54.9%	162	36.6%	27.430a	0.285
	WHITE Irish	2	66.7%	0	0.0%	1	33.3%			0	0.0%	2	66.7%	1	33.3%		
	WHITE European	11	84.6%	1	7.7%	1	7.7%			3	23.1%	8	61.5%	2	15.4%		

	WHITE Gypsy	1	100.0%	0	0.0%	0	0.0%			0	0.0%	1	100.0%	0	0.0%		
	WHITE Any other	7	70.0%	2	20.0%	1	10.0%			2	20.0%	4	40.0%	4	40.0%		
	MIXED Black Caribbean	1	50.0%	1	50.0%	0	0.0%			0	0.0%	2	100.0%	0	0.0%		
	MIXED Black African	2	100.0%	0	0.0%	0	0.0%			0	0.0%	0	0.0%	2	100.0%		
	MIXED Asian	1	100.0%	0	0.0%	0	0.0%			0	0.0%	0	0.0%	1	100.0%		
	MIXED Other	2	100.0%	0	0.0%	0	0.0%			0	0.0%	0	0.0%	2	100.0%		
	ASIAN Indian	1	100.0%	0	0.0%	0	0.0%			0	0.0%	0	0.0%	1	100.0%		
	ASIAN Chinese	2	100.0%	0	0.0%	0	0.0%			0	0.0%	1	50.0%	1	50.0%		
	ASIAN Other	4	80.0%	1	20.0%	0	0.0%			0	0.0%	3	60.0%	2	40.0%		
	BLACK Caribbean	2	100.0%	0	0.0%	0	0.0%			0	0.0%	0	0.0%	2	100.0%		
Single parent	No	377	83.0%	50	11.0%	27	5.9%	0.123[a]	0.94	41	9.0%	248	54.6%	165	36.3%	1.212a	0.545
	Yes	28	84.8%	3	9.1%	2	6.1%			2	6.1%	16	48.5%	15	45.5%		
How old is your preschool child?	2 years	123	85.4%	12	8.3%	9	6.3%	4.501	0.609	13	9.0%	72	50.0%	59	41.0%	3.413	0.755
	3 years	148	83.1%	23	12.9%	7	3.9%			17	9.6%	97	54.5%	64	36.0%		
	4 years	103	80.5%	14	10.9%	11	8.6%			9	7.0%	72	56.3%	47	36.7%		
	5 years	31	83.8%	4	10.8%	2	5.4%			4	10.8%	23	62.2%	10	27.0%		
	Girl	194	82.9%	31	13.2%	9	3.8%	5.682	0.058	23	9.8%	129	55.1%	82	35.0%	1.028	0.598

What is the gender of your preschool child?	Boy	211	83.4%	22	8.7%	20	7.9%			20	7.9%	135	53.4%	98	38.7%		
Physical / mental health conditions?	Yes	5	83.3%	0	0.0%	1	16.7%	2.102[a]	0.35	0	0.0%	2	33.3%	4	66.7%	2.804	0.245
	No	400	83.2%	53	11.0%	28	5.8%			43	8.9%	262	54.5%	176	36.6%		

		Do you feel that pottering is a suitable term?								What do you think of the description for Pottering?							
		Yes		No		Don't know		χ^2	P	Not a very clear description		An adequate description		A very clear description		χ^2	P
		n	%	n	%	n	%			n	%	n	%	n	%		
Gender	Mother	413	91.0 %	19	86.4 %	8	72.7 %	3.326 *	0.19	13	76.5 %	262	91.6 %	165	89.7 %	4.372	0.112
	Father	41	9.0%	3	13.6 %	3	27.3 %			4	23.5 %	24	8.4%	19	10.3 %		
Age range	Under 18	1	0.2%	0	0.0%	0	0.0%	11.016*	0.685	0	0.0%	1	0.3%	0	0.0%	13.511*	0.487
	21-25	6	1.3%	2	9.1%	0	0.0%			2	11.8 %	3	1.0%	3	1.6%		
	26-30	44	9.7%	1	4.5%	1	9.1%			2	11.8 %	20	7.0%	24	13.0 %		
	31-35	147	32.4 %	7	31.8 %	3	27.3 %			5	29.4 %	95	33.2 %	57	31.0 %		
	36-40	186	41.0 %	6	27.3 %	5	45.5 %			6	35.3 %	123	43.0 %	68	37.0 %		
	41-45	57	12.6 %	6	27.3 %	2	18.2 %			2	11.8 %	37	12.9 %	26	14.1 %		
	46-50	10	2.2%	0	0.0%	0	0.0%			0	0.0%	5	1.7%	5	2.7%		
	51-55	3	0.7%	0	0.0%	0	0.0%			0	0.0%	2	0.7%	1	0.5%		
IMD Quintiles Low to high	5th	44	10.9 %	1	5.0%	2	20.0 %	7.899 *	0.617	1	5.9%	28	10.9 %	18	11.3 %	8.153 *	0.419
	4th	51	12.7 %	1	5.0%	1	10.0 %			1	5.9%	29	11.3 %	23	14.5 %		
	3rd	63	15.6 %	4	20.0 %	0	0.0%			6	35.3 %	40	15.6 %	21	13.2 %		

	2nd	111	27.5 %	4	20.0 %	3	30.0 %			2	11.8 %	74	28.8 %	42	26.4 %		
	1st	134	33.3 %	10	50.0 %	4	40.0 %			7	41.2 %	86	33.5 %	55	34.6 %		
Employment category	Working full time	108	23.8 %	4	18.2 %	2	18.2 %	15.536*	0.114	4	23.5 %	66	23.1 %	44	23.9 %	6.783	0.872
	Working part time	226	49.8 %	13	59.1 %	5	45.5 %			9	52.9 %	140	49.0 %	95	51.6 %		
	Full time parent	69	15.2 %	1	4.5%	1	9.1%			1	5.9%	46	16.1 %	24	13.0 %		
	Student	6	1.3%	3	13.6 %	0	0.0%			2	11.8 %	2	0.7%	5	2.7%		
	Maternity/adoption leave	40	8.8%	1	4.5%	2	18.2 %			1	5.9%	29	10.1 %	13	7.1%		
	Not currently employed	5	1.1%	0	0.0%	1	9.1%			0	0.0%	3	1.0%	3	1.6%		
Highest education in household	GCSE / GNVQ	15	3.3%	0	0.0%	2	18.2 %	18.582*	0.099	1	5.9%	10	3.5%	6	3.3%	6.783	0.872
	A levels	45	9.9%	1	4.5%	1	9.1%			2	11.8 %	27	9.4%	18	9.8%		
	Degree	142	31.3 %	8	36.4 %	0	0.0%			6	35.3 %	83	29.0 %	61	33.2 %		
	Postgraduate	171	37.7 %	9	40.9 %	4	36.4 %			6	35.3 %	108	37.8 %	70	38.0 %		
	Apprenticeship	4	0.9%	1	4.5%	0	0.0%			1	5.9%	3	1.0%	1	0.5%		
	Professional qualifications	66	14.5 %	3	13.6 %	4	36.4 %			1	5.9%	47	16.4 %	25	13.6 %		

	Vocational qualifications	11	2.4%	0	0.0%	0	0.0%			0	0.0%	8	2.8%	3	1.6%		
Ethnic Origin	WHITE British	416	91.6 %	20	90.9 %	7	63.6 %	23.249*	0.505	15	88.2 %	259	90.6 %	169	91.8 %	34.50 *	0.076
	WHITE Irish	3	0.7%	0	0.0%	0	0.0%			0	0.0%	3	1.0%	0	0.0%		
	WHITE European	12	2.6%	1	4.5%	0	0.0%			0	0.0%	11	3.8%	2	1.1%		
	WHITE Gypsy	1	0.2%	0	0.0%	0	0.0%			0	0.0%	1	0.3%	0	0.0%		
	WHITE Any other	9	2.0%	0	0.0%	1	9.1%			0	0.0%	6	2.1%	4	2.2%		
	MIXED Black Caribbean	2	0.4%	0	0.0%	0	0.0%			0	0.0%	1	0.3%	1	0.5%		
	MIXED Black African	2	0.4%	0	0.0%	0	0.0%			0	0.0%	0	0.0%	2	1.1%		
	MIXED Asian	1	0.2%	0	0.0%	0	0.0%			0	0.0%	0	0.0%	1	0.5%		
	MIXED Other	2	0.4%	0	0.0%	0	0.0%			0	0.0%	0	0.0%	2	1.1%		
	ASIAN Indian	0	0.0%	0	0.0%	1	9.1%			0	0.0%	1	0.3%	0	0.0%		
	ASIAN Chinese	2	0.4%	0	0.0%	0	0.0%			0	0.0%	1	0.3%	1	0.5%		
	ASIAN Other	3	0.7%	1	4.5%	1	9.1%			2	11.8 %	3	1.0%	0	0.0%		
	BLACK Caribbean	1	0.2%	0	0.0%	1	9.1%			0	0.0%	0	0.0%	2	1.1%		
Who lives with you - No other adults	No	423	93.2 %	20	90.9 %	11	100.0 %	1.715*	0.425	16	94.1 %	266	93.0 %	172	93.5 %	0.062	0.97
	Yes	31	6.8%	2	9.1%	0	0.0%			1	5.9%	20	7.0%	12	6.5%		

How old is your preschool child?	2 years	136	30.0%	6	27.3%	2	18.2%	6.145*	0.407	4	23.5%	72	25.2%	68	37.0%	8.602	0.197
	3 years	167	36.8%	8	36.4%	3	27.3%			8	47.1%	108	37.8%	62	33.7%		
	4 years	117	25.8%	5	22.7%	6	54.5%			4	23.5%	82	28.7%	42	22.8%		
	5 years	34	7.5%	3	13.6%	0	0.0%			1	5.9%	24	8.4%	12	6.5%		
What is the gender of your preschool child?	Girl	220	48.5%	10	45.5%	4	36.4%	0.691	0.708	7	41.2%	139	48.6%	88	47.8%	0.36	0.835
	Boy	234	51.5%	12	54.5%	7	63.6%			10	58.8%	147	51.4%	96	52.2%		
Does your preschool child have any physical or mental health conidtions...?	Yes	5	1.1%	1	4.5%	0	0.0%	1.517	0.468	1	5.9%	3	1.0%	2	1.1%	1.699	0.428
	No	449	98.9%	21	95.5%	11	100.0%			16	94.1%	283	99.0%	182	98.9%		

Appendix 16

Open Access Research

BMJ Open

Mothers' perceptions of the UK physical activity and sedentary behaviour guidelines for the early years (Start Active, Stay Active): a qualitative study

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ABSTRACT

Objectives: Higher levels of physical activity (PA) during early childhood have been associated with improved health outcomes, whereas sedentary behaviour (SB) has been associated with poorer health outcomes in children. In 2011, the UK produced guidelines for PA and SB in children under 5 years. Mothers have been identified as key influences in young children's PA and SB. The aim of this study was to use in-depth interviews with mothers of preschool children to examine attitudes to the guidance.

Design: Qualitative study using one-to-one, semistructured interviews; Data were analysed thematically using a framework approach.

Setting: Mothers were recruited from preschools, nurseries, and mother and toddler groups located in four areas of varying socioeconomic status within Bristol, UK.

Participants: 24 mothers who were considered the main or joint carer for a preschool child who was at least 2 years of age but had not yet started formal schooling.

Results: Mothers are not aware of the UK PA and SB guidelines for the early years. They believe that their child achieves the guideline targets for PA and SB and therefore, they do not believe these quidelines are relevant to them. Mothers feel that an increase in PA and reduction in SB (especially screen-viewing) would cause stress for mothers. Mothers found defining and quantifying PA and SB in their preschool child problematic.

Conclusions: As mothers do not identify with the need to increase PA or reduce SB in their child, awareness of the guidelines alone is unlikely to initiate behaviour change. Information on how mothers can make a more accurate assessment of their preschool child's PA and SB levels, and information about the benefits of increased PA and reduced SB should be provided alongside the guideline targets. Clear messages need to be developed that reframe the guidelines into pragmatic and usable targets.

Strengths and limitations of this study

- The results of this paper provide a useful insight into the impression the UK physical activity and sedentary behaviour guidelines for the early years makes on mothers. The findings are informative for the development and dissemination of physical activity and sedentary behaviour promotion initiatives for the early years, and the design of the interventions.
- A diverse sample of mothers were recruited in terms of varying socioeconomic status areas, which included both urban and rural areas, working and non-working mothers and lone parents.
- The majority of mothers were of white ethnicity and the views of other ethnic groups were not represented.
- Mothers may have been inclined to give socially desirable responses and there was a possibility of selection bias as it may be that mothers with an interest in physical activity were more willing to take part in the study.

BACKGROUND

Higher levels of physical activity (PA) and lower levels of sedentary behaviour (SB) during early childhood (under 5 years) have been associated with a number of improved health and developmental outcomes.[1–16] In recent years, there has been growing research interest in the PA and SB levels of children under the age of 5 and a number of nations (Australia,[17] Canada,[18 19] USA[20] and the UK[21]) have produced PA and SB guidelines for this age group. In the UK, the four Chief Medical Officers published PA and SB guidelines for the early-years (from birth to 5 years) for the first time in 2011.[21] The UK guidelines state that children under 5 years who can walk unaided should be physically active for at least 180 min each day. This PA can be of any intensity (low-to-vigorous intensity), and spread throughout the day. PA in this age group mostly comprises of active play, which the guidelines define as an

activity that involves moving the trunk and more exertion than the minimal movement required to carry out everyday tasks, such as washing and dressing or passive play (eg, craft activities, dressing up or playing at a sand table). In addition to active play, active travel may also be an important contribution to young children's PA (eg, walking). The SB guidelines advise that for both children who can and cannot walk, extended periods of sedentary time should be minimised (except sleeping). SB in this age group includes being restrained in a car seat, highchair or pushchair, screen-viewing, crafts, reading and puzzles. The guidelines emphasise that time spent restrained in car seats, highchairs or pushchairs and screen-viewing are the targeted SBs to be reduced. Unlike other nations,[17 19 20] the UK guidelines do not provide an advised maximum time for screen-viewing.[21] The Australian[17] and Canadian[19] guidelines suggest that children between 2 and 5 years of age should have less than 1 h and the American[20] guidelines suggest less than 2 h of screen-viewing time per day.

Although the UK guidelines refer to any intensity of PA, the majority of studies measuring PA levels in preschoolers (age 3 until start of formal schooling, usually at age 5) only report minutes of moderate-to-vigorous PA per day.[22 23] Thus, based on the current data it is difficult to draw any meaningful conclusions about UK preschoolers' overall activity levels in relation to the UK guidelines. In addition, variations in study methodologies (sampling, accelerometer wear time) as well as accelerometer models and cut-points used to process accelerometer data make it difficult to accurately compare data and draw conclusions on preschoolers' activity levels.[24 25] Despite these limitations, current accelerometer[22 23] and parent-report[26] derived data of preschoolers' PA levels indicate that they may not be meeting the UK government's recommendations. Research also suggests that screen-viewing accounts for a considerable amount of a preschool child's day, with many children exceeding 2 h per day.[27 28] This evidence highlights the need to identify ways to encourage PA and reduce screen-viewing among preschool children.

Parents play a key role in influencing preschoolers' PA and SB,[27 29–33] and are likely to be key mediators of behaviour change.[4 34 35] It is, therefore, important to understand their views towards these behaviours and whether they view the UK guidelines as realistic and appropriate. The aim of this study was to examine mothers' attitudes to the UK PA and SB guidelines for the early years.

METHODS

In-depth interviews were held with mothers of preschool children (aged 2 years until they started formal schooling). We included 2-year-olds in our definition of preschool in order to align our study with the UK PA and SB guideline's that are divided into two groups of children who have not yet started formal schooling: children who can and cannot walk. By the age of 2 years, the majority of children are competent walkers. Only mothers were recruited for this study as they tend to be the main caregiver. GFB, who has experience in qualitative research and had completed qualitative research training, carried out the recruitment and data collection.

Recruitment and sampling

Recruitment was targeted within four areas of varying socioeconomic status (SES), and in rural and urban communities in order to see if there were differences in mothers' perceptions within these areas. SES was defined by tertiles of the 2010 index of multiple deprivation (IMD) (http://data.gov.uk/dataset/index-of-multiple-deprivation), assessed by residential postcode. The IMD score estimates area deprivation based on indicators of income, health, education and employment status, where a higher score equals a higher level of deprivation. One urban neighbourhood from each of the first, second and third tertile of the IMD within the City of Bristol, UK and one rural neighbourhood 13 km south of Bristol (second tertile of IMD) were targeted for recruitment.

The managers of centres and groups that were within the four areas were contacted to gain permission for the researcher to speak directly to mothers attending their centre. Information about the study was given via posters and leaflets to preschools, day nurseries and mother and toddler groups located within these areas at least 1 week prior to recruitment. GFB approached mothers face-to-face either during the group time or at child pick-up/drop-off time. Mothers were provided with a study information sheet and asked if they would be willing to take part in a one-to-one interview. They were given time to read the information sheet and asked to return a signed consent form to the researcher, via a prepaid envelope, if they were willing to take part. Once the consent form had been received by the researcher, mothers were contacted via telephone to arrange the interview. Mothers were eligible to take part if they were the main or joint carer for a preschool child, and could speak English.

Fourteen centres were approached for recruitment. Of these, eight allowed face-to-face recruitment with mothers and a further three allowed information to be given to mothers via centre staff. Forty-two mothers verbally agreed to take part in the study (9 from high-SES, 12 from mid-SES, 8 from low-SES and 13 from a rural mid-SES area). Forty of these were approached via face-to-face recruitment, and two contacted the researcher after reading an information sheet. Interviews were arranged at a time and place that was convenient for the mother. Those who were unable or unwilling to meet face-to-face were offered the option of a telephone interview.

Data collection

Three mothers dropped out of the study when contacted to arrange an interview (1 high-SES, 2 rural), and a further four participants did not turn up for the

interview (2 low-SES, 1 mid-SES, 1 rural). Most of the interviews were held between April and June 2013, and a further four were undertaken in May 2014. All were conducted by GFB. The last four interviews were held because initial analyses revealed that data saturation had not been met. The time delay in conducting these interviews was due to GFB being on maternity leave. A semi-structured topic guide was used to ensure consistency across the interviews. Areas discussed in the interviews included:

1. Details of their family and their preschool child's personality
2. Details of the preschool child's week and daily routine (including opportunities for PA and SB)
3. Participants' views on their child's PA and SB behaviours
4. Participants' reactions to the UK PA and SB guidelines for the early years.

This paper focuses on parents' reactions to the UK PA and SB guidelines. The interviewer first asked participants if they knew of the UK PA and SB guidelines for preschool children. The interviewer gave a description of the main PA and SB targets set out by the guidelines (ie, 180 min (3 h) of PA per day and a reduction in sedentary time) and participants were asked to discuss their reactions to this. A further explanation was then given of the details of the PA and sedentary behaviour guidelines (ie, the range of intensity PA included in the guidelines, the definition of active play and activities considered sedentary), and participants were again asked to give their reaction to this and discuss them in relation to their preschool child.

Twenty-six interviews were carried out and lasted between 23 and 67 min (mean 46 min). Two interviews were terminated (at the request of the participant because of childcare problems) before the guidelines were discussed and so were not included in this analyses. Ten interviews were conducted in the parents' home, three within the location of recruitment (children's centre), and 13 over the telephone. Data collection and analysis were undertaken in parallel, so that themes from earlier data collection could inform the focus of later interviews and enable GFB to establish when sufficient data had been collected. Data collection ended when data saturation had been reached, that is, no new themes emerged from the analysis.

Data analysis

Interviews were audio recorded, and subsequently transcribed verbatim by an external transcription company. GFB anonymised the transcripts before analyses started. Data were analysed using thematic analysis.[36] This initially involved reading and re-reading the interview transcripts in order to gain an overall understanding of the mothers' views and experiences, and to consider what codes could be applied to the data. Two researchers (GFB and KMT) independently read and coded a sample of transcripts. Discrepancies in coding were then discussed. This led to new codes being developed and existing codes being deleted or defined more clearly. Once the data had been fully coded, data coded under specific codes were retrieved and overarching or central themes identified.

Our analytical approach enabled us to make comparisons within and across the transcripts, and was inductive in nature; this ensured our findings stayed grounded in the data. To avoid bias, we independently coded transcripts, looked for deviant cases, discussed our interpretation of the data within the research team and ensured all findings could be traced back to sections of the transcripts.

Transcripts were imported into NVivo (V.10.0, QSR, Southport, UK) to allow for electronic coding and retrieval of data. To assist with the systematic interpretation of the data, an approach based on framework analysis[37] was used. This entailed summarising data pertaining to specific codes in tables. Comparisons were then made within and across the data. Quotes reproduced in this paper have been tagged with the interview number, whether the interviewee resided in the low-SES, mid-SES, high-SES or rural mid-SES location and the sex of the child.

RESULTS

Details of participants interviewed are provided in table 1. Mothers had an average of 2.2 children (ranging from 1 to

Table 1 Participant characteristics (mothers n=24; preschool children n=27)

	N	Per cent
Area of recruitment	5	20.8
Low-SES		
Mid-SES	6	25
High-SES	7	29.2
Rural subgroup		
Mid-SES	6	25
Mothers' details		
Lone parent	4	16.7
Mothers' employment		
None	15	62.5
Part-time	6	25
Full-time	3	12.5
Child details		
Child age (years)		
2	3	11.1
3	17	63
4	7	25.9
Child sex		
Female	12	44.4
Male	15	55.6
Younger siblings		
Yes	7	25.9
No	20	74.1
Older siblings		
Yes	11	40.7
No	16	59.3
Only child	7	25.9

SES, socioeconomic status.

4 children), with an age range of 7 months to 14 years. Three of the mothers had two children of preschool age, in which case both children were discussed in the interview. Results are presented below under four main headings: (1) knowledge of the guidelines; (2) reactions to the PA targets; (3) reactions to the SB targets; (4) feelings towards the guidelines. Table 2 gives an overview of these results. Initial analyses showed that similar beliefs were expressed from mothers regardless of the area they resided in or the sex of their preschool child.

Knowledge of the guidelines

Around 90% of participants said they were not aware of the PA and SB guidelines for preschool children. A few were aware they existed but did not know what these were. Only one mother had read the guidelines (mid-SES). She had specifically sought out the information as she was keen to find out about obesity prevention strategies for her son.

> Participant: Yes it's something that I've been aware of because I know I don't, I'm quite bonny [overweight] and my husband's quite overweight… so I think it's made me sort of hyper aware for [Son] and not wanting him to be in the same position that I am.
>
> Interviewer: So it was actually something you actively looked into?
>
> Participant: Yes, yes. P44, Mid SES, Boy

Reactions to the physical activity targets

Initially, most participants reported that they felt the target of 180 min per day sounded a lot to achieve. However, once it was explained that the 180 min could be spread throughout the day, could be of any intensity and a definition of PA was given, nearly all of the participants felt that the guidelines were easily achievable and some felt that their child exceeded this target. Just two mothers (both parents of girls and from the high-SES area) felt their child was not very active. They both said that this was because they felt that their child was predominantly interested in sedentary activities such as reading or crafts. All mothers from the low-SES, mid-SES and rural mid-SES area felt that their child was sufficiently active or very active.

> It seems high but when you think about the amount of things that you do in a day then it is actually quite easy to reach that time. It does sound daunting, 3 hours is a long time. But when you break it down… P35, High SES, 2 boys

> I think she's probably a bit below average in terms of energy, I don't think she's one of those hyper children definitely not because she's always been quite a calm child really in a way. I think really probably she's a quieter kind of child in terms of, she has the energy but she chooses not to, do you know what I mean she likes to sit and look at a book or something so challenging her mind rather than burning it all off running about I think. P14, High SES, Girl

Around two-thirds of mothers held the view that preschool children were naturally very active, they needed little encouragement to be active, and some felt that their child had no capacity for more activity. Mothers suggested that children need periods of rest because they get tired from their high-activity levels.

Table 2 Summary of results

1. Knowledge of the PA and SB guidelines	Most mothers were not aware of the guidelines A few mothers knew that they existed, but did not know the recommended PA or SB targets
2. Reactions to the PA targets	Mothers felt that the targets were easily achievable and their child already met them Preschool children were seen as naturally active and mothers commented that there was no more capacity from the parent or child to achieve more activity Mothers were uncertain how to define and quantify physical activity in their preschool children
3. Reactions to the SB targets	Mothers felt that the SB guidelines were acceptable Most mothers felt that their preschool child had appropriate levels of SB and screen-viewing Many mothers had rules and restrictions on screen-viewing time Screen-viewing was viewed as acceptable and beneficial in moderation There was some concern that activities that mothers valued, such as crafts and reading, were included in the SB guidelines Reducing time spent in car seats and pushchairs was not seen to be feasible by some mothers
4. Attitudes towards the PA and SB guidelines	The guidelines were viewed as too broad and mothers suggested making them more specific to make appropriate for developmental stages, gender, and natural activity levels There was concern that the guidelines may cause stress and guilt for parents

PA, physical activity; SB, sedentary behaviour.

> I don't know how easy it would be though to increase it, we do quite a lot… he does normally just get quite tired near the end of the day so I would have thought he is already at his max. P28, Rural Mid-SES, Boy

The definition of PA in preschool children was questioned by around three-quarters of the mothers interviewed. They found it hard to classify children's activity and play as either physically active or sedentary, especially activities such as dressing up, crafts and play around the home. Television viewing (TV) was disputed as a sedentary activity because their child was often moving around or playing while the TV was on. Participants explained that their uncertainty in defining PA for preschool children, and the sporadic nature of their child's play made it very difficult to assess how much activity their child did in a day.

> It depends on I guess what you say that it [PA] actually is. If it is just kind of playing. Yeah I think it's very difficult at that age to measure it… It does seem a lot though, but I would think, I have no idea how she compares to that P10, Low SES, Girl.

> I think it's quite a random number to come out really because I think preschool children play in different ways really and erm you know like my daughter probably ends up walking quite a long way because she spends a lot of the day on her feet but she doesn't actually probably, I mean she does a little bit of running but she's not erm running all over the place the whole time, so yes I don't know it's a bit, I don't know I think it is a very difficult thing to calculate. P43, Mid SES, Girl

Mothers defined their child's PA using a number of different examples (not all of which would be classed as physically active according to the guidelines). These included types of play (eg, playing with siblings, outdoor play, role play, imaginative play), organised activities and groups (eg, rugby, swimming, toddler groups), being in formal day care (eg, nursery or preschool), active transport (walking to and from school, not using the pushchair) and the nature of their personality (eg, being on the go all the time, not sitting down, taking an active interest in things and asking questions).

> He definitely will have had over 3 hours because he's been in the garden in the morning and the afternoon he's been at preschool. P35, High SES, Boy

Reactions to the sedentary behaviour targets

Most participants considered the guideline's suggestion that sedentary time should be reduced to be acceptable and sensible. One mother remarked that the aim of reducing SB, rather than setting a specific time limit, made it more achievable.

> Yes I suppose that's good isn't it because that's immediately achievable by everybody because to reduce it means it doesn't matter whether it's a reduction of 5 minutes or 3 hours if you're reducing it you're actively thinking about trying to get them to put the games console down or do something different. P14, High SES, Girl

Preschool children's SB was often described as a period of time to relax, unwind or calm down by mothers. Mothers most commonly referred to screen-viewing when talking about this time, but also mentioned other activities such as cuddles, reading, napping, having milk and snacks, cooking and crafts. Time spent in a car seat or pushchair was not mentioned as a SB unless prompted by the interviewer.

> Um she loves cooking, so we tend to do a bit of cooking usually in the morning, they like that, and then quite often, we'll just cuddle up on the sofa and watch a film or things like that. P18, Mid SES, Girl

Most of the mothers interviewed felt that minimising screen-viewing was sensible and feasible, and some acknowledged adverse effects of screen-viewing for their child. These adverse effects included that screen-viewing is addictive, distracts the child from playing, and makes their child unresponsive. However, many parents were unable to define why they thought that screen-viewing should be minimised.

> I just don't like them to watch too much TV, I don't like the thought that they're just sat there. P13, Mid SES, Boy

Although the majority of mothers felt that minimising screen-viewing was appropriate, they also felt that their child currently had acceptable levels of screen-viewing and no reduction was necessary. Mothers who expressed concerns over the effect of screen-viewing on their child talked about actively monitoring its use using strategies such as breaking up TV watching time during the day and setting time limits. However, parents admitted it was easy to lose track of how much time their child spent screen-viewing.

> Sometimes I do feel like she's been on the tablet for too long as well erm because sometimes before you realise she's been sort of playing games and watching songs and things for like you know half an hour and then it's an hour and you didn't realise, because you've been busy doing stuff you realise she's just been sat there doing it. P12, High SES, Girl

The majority of mothers also felt that screen-viewing in moderation was acceptable as long as it was balanced alongside PA and other activities. Screen-viewing was often seen to be a useful educational tool and a way for preschoolers to rest.

> Um I think everything in moderation really. There are days if they're under the weather, or they're tired, they're quite happy to sit down all day and I don't think that's a bad thing, but I think, as long as they get some exercise most days. P15, Mid SES, Girl

> I would agree in terms of I think less telly would be a good thing… but if they're … or if, you know, if they're watching some of the programmes which are clearly like about developing language or letters or numbers, educational. I think you need to define sedentary activity better. P31, High SES, 2 Boys

There was some concern that sedentary activities may be included in the guidelines that mothers valued for their child, especially crafts and reading. Many mothers felt that a balance of activities is appropriate and rest, crafts and intellectual activities were as important as PA.

> Yeah fair enough, they shouldn't be doing that [spending a long time screen-viewing] but generally no, every child I think no matter what their age, even the parents like that, nice quiet time, having cuddles, reading a story together you know. P22, Low SES, Boy

> I don't know, I think if they're probably doing 3 hours … because there's benefits to that as well so … there's benefits to sitting down doing something … you know, they can … I don't know, be creative and use their imagination I think that's important as well. P21, High SES, 2 Girls

The practicalities of reducing time spent in a pushchair or car seat were questioned by some mothers. Mothers felt that they were only used when really necessary and it was suggested that this was not an appropriate expectation of the guidelines.

> I think the pushchair or car seat thing erm isn't always an achievable thing to… not all pre-school children like to walk the way that you want to walk. And so actually it's not, you know it could be along a busy road you know or they could just want to be looking at everything else and you actually need to get from A to B so it's not always a possible thing to achieve things like that. P43, Mid SES, Girl

Attitudes towards the guidelines

Some mothers reported that they felt the guidelines were unnecessary. For example, two parents mentioned that if they had heard of the guidelines they would not have taken notice of them because they felt their child was sufficiently active. In addition, another parent felt they were not relevant to her family.

> I'd like to think that we were on the healthier side of the middle start. I kind of look at the, not that, you know, I'm feeling smug and saying well it doesn't affect me but more that we're consciously doing it already. But I think the Government recommendations are really to try and pull those people who, you know, chuck the kids in front of the TV all day long… and you know sort of give them crisps and chocolate all day long. P36, High SES, 2 Girls

One mother suggested that preschool children did not need additional encouragement to be active as they are already sufficiently active.

> I think most children are generally active at that age. I don't, they don't need the encouragement that adults need. P15, Mid SES, Girl

The guidelines were viewed as being too broad, and some mothers gave suggestions on how this may be improved. For instance: making the guidelines gender specific to accommodate the different playing styles of boys and girls (boys being described as engaging in boisterous play, and girls engaging in creative and imaginative play); making the guidelines age specific to allow these to be more appropriate for the developmental stages of this age group (a 2-year-old plays very differently to a 5-year-old); and making them adaptable for children with different activity levels so that children with low levels of activity may receive different recommendations than children with high levels of activity.

> Erm, reduced from what, though because I think that's different for different personalities, because you've got some children, especially boys, you cannot get them to sit down and colour a picture because they're just not interested but girls will quite happily kneel down and play with a dolls house for hours….I think I know it really is a blanket statement but I think in general boys and girls are different like that because of the you know the fine motor skills for girls and then the large motor skills for boys. P39, Low SES, Boy

> Um I'd say at a five year old level then yes, but under five, I mean is that literally from walking to five is it? Yeah I'd say it's a bit unachievable for kind of a two year old. P15, Mid SES, Girl

Participants were concerned the guidelines could cause some stress and pressure for parents. Increasing PA was thought to require extra effort from the mother, which often did not feel feasible due to their own energy and time constraints. This was felt to cause a feeling of failure or guilt for some mothers who did not feel they had the capacity they felt was required to provide their child with additional activity opportunities.

> Um, I don't think I'd be able to cope with 3 hours of activity every day to be honest you know. I'm a busy mum, I've got a lot to do. Housework and everything else you know. It's impossible for me to be able to just kind of put that amount of time aside to do something. P22, Low SES, Boy

> Ideally all parents would like to do this, it's good to have the reminder but the reality isn't that easy. If a mum has had a bad day or the child is having a bad day then you'd take them out in the car or sit them in front of the TV just to get through it. It helps. It puts a lot of pressure on parents. If someone asked me to reduced sedentary time I would be mindful of it but I would be shocked that they asked. P57, Rural Mid-SES, Boy

Some mothers gave suggestions on how parents may help their child achieve the guidelines. When giving

these suggestions they were talking about 'other mothers' and not in relation to their own circumstances because they did not feel that their families needed change. These included lifestyle changes such as walking rather than using a pushchair or the car, providing more opportunities to play outdoors, enrolling the child in organised activities, being more involved and playing with the child, and encouraging creative activities as a replacement to screen-viewing.

DISCUSSION

The data presented in this paper suggests that mothers of preschool children are not aware of the PA and SB targets in the UK guidelines for the early years. Once informed about the guidelines, mothers felt that they were appropriate for preschool children in general but not relevant to their family, mainly because they believed that their preschool child was already meeting the guideline PA and SB targets. This was reflected in the tendency for mothers to talk about 'other families' when discussing the guidelines as they felt that their own family had no need for change or that the guidelines were aimed at 'other families'. This inclination to deflect discussion of screen-viewing in their child to other parents because they do not see a relevance for their family has been noted by another qualitative study.[38]

Mothers in this study were unaware of the specific PA and SB targets for the early years. The guidelines state that the aim is for as many people as possible to use them and achieve the guidelines recommended activity levels.[21] However, following the development of the guidelines in 2011, there was no specific health campaign to publicise the new PA and SB targets; however, these were incorporated into the pre-existing Change4Life social marketing campaign and National Health Service Choices promotional material.[39] No other studies have investigated parental knowledge of child PA guidelines, but a national survey conducted 2 years following the publication of the guidelines found that only 18% of adults could correctly recall the current PA guidelines.[40] This lack of awareness of the guidelines is evident in this sample of mothers' and reflects the ineffectual dissemination of the new advised PA and SB targets. This is not a problem unique to the UK as mothers from Canada have also been reported have a lack of knowledge of their SB guidelines.[41] Mothers interviewed in the Canadian study suggested that guideline information was provided through healthcare professionals early on during motherhood or even during pregnancy to prevent sedentary habits from forming.[41]

Knowledge of the PA guidelines has been shown to be important to instigate behaviour change.[42] However, results from this study indicate that mothers may not be receptive to the guidelines because they feel, for example, their preschool child is already engaging in sufficient PA and therefore, do not feel the guidelines are relevant to them. This suggests that presenting mothers with PA and SB targets alone is not sufficient to instigate behaviour change and that further actions are needed. In addition to this, mothers were concerned that an increase in PA may be problematic for them or their child as they felt they were doing as much as they were able to do. This study and others indicate that some parents have concerns that increased PA and reduced SB means the displacement of activities mothers' value such as reading and crafts.[38 41 43] In addition to this, mothers reported that they were satisfied with the amount of time their child spent screen-viewing and they had no need or desire to make any changes. Screen-viewing was valued as an educational tool as well as a means for preschoolers to relax. However, a systematic review of sedentary behaviour and health indicators in the early years found that no evidence exists to indicate that TV-viewing is beneficial for cognitive development or psychosocial health.[11] It has previously been reported that parents' use screen-viewing as a coping strategy, in order for them to either do household chores or rest themselves,[38 41 43] and this was also reported by mothers in this study. Children with parents experiencing high levels of parenting stress have been reported to be less likely to set limits on the amount of TV they watched by their parents (OR=0.32, 95% CI 0.11 to 0.93) than children with normally stressed parents,[44] thus highlighting the use of screen-viewing as a coping strategy for mothers. Some mothers reported that they enforced screen-viewing rules and restrictions, which have been cited to influence the type of sedentary activity a child participates in at home;[45] however, these restrictions were not always successful for these mothers. Therefore, when promoting the PA and SB guidelines to mothers, helping them identify a need for change and addressing barriers to change will need to be considered. Including specific strategies to support change to meet the guidelines would be welcomed by parents.[41] Messages that are framed based on the potential gain to both the child and the parent (rather than negative or loss-framed messages), and that enhance self-efficacy have been cited as being most effective in PA promotion.[46]

The lack of translation of the guidelines into a message that is accessible and practical for public use is evident in this study, where many mothers found the terms 'physical activity' and 'sedentary behaviour' for this age group confusing and hard to define. Similarly, an Australian qualitative study by Dwyer *et al*[47] found that parents considered the concept of PA intensity difficult to apply to their preschool child's PA. Mothers tend to describe their child as active, regardless of their true activity levels (ie, describing their child as active when they do not meet the government guidelines for PA), indicating that they may not be making accurate estimations.[48] Identifying PA in this age group is challenging. First, the guidelines define PA as activities which involve movements of all the major muscle groups; however, activities such as dressing-up and playing at a sand table are also given as examples of non-physical activities,

which some mothers in this study used as activities to describe their child's PA. This ambiguity and lack of clear distinction makes it difficult for parents to assess their own child's PA. Second, PA in preschoolers occurs in short spontaneous bouts throughout the day, thereby making calculating PA time problematic. In a recent accelerometry study, Ruiz *et al*[49] identified four patterns to describe PA in preschool children where each contain varying brief periods of vigorous-PA, moderate-PA and light-PA, and sedentary activity throughout the day. Ruiz's study highlights that unlike adults and older children, preschool children incorporate PA in short bouts throughout most of their waking hours. Although the majority of mothers said that their preschool child was meeting the guideline targets, their uncertainty in defining and quantifying PA and SB of their child means they may not be making accurate assessments. Therefore, PA and SB recommendations need to be translated into accessible public messages that help mothers make more accurate estimations of their child's PA and SB levels. These messages should be clearly communicated and be appropriate to the child's developmental stage.

The data presented in this paper highlights similar views from mothers from varying SES, and urban and rural areas. A review of correlates of preschool children's PA reported that SES was not associated with PA.[50] In addition, although some studies suggest that children from low-SES areas are more likely to have higher levels of screen-viewing,[51 52] a number of studies have suggest that screen-viewing time is equally distributed across SES groups.[53–55] This finding might suggest that targeted health promotion efforts for preschoolers may not be required. Some mothers identified a need for gender-specific guidelines because of the different way in which boys and girls play. Correlates of preschool PA levels[56] and compliance with screen-viewing recommendations[53] varies between boys and girls. In addition, mothers felt that more specific guidance was necessary to account for differences in energy levels and age stages between children. This suggests that messages that mothers can identify with for children with different play styles, personalities and developmental stages should be considered.

Strengths and limitations

The results of this paper provide a novel and useful insight into the mothers' knowledge and perspectives of the guidelines; they are a fundamental influence on the PA and SB behaviours of preschool children. A strength of this study is that a diverse sample of mothers were recruited in terms of varying SES areas, which included both urban and rural areas, working and non-working mothers and lone parents. A sufficient number of mothers were interviewed from each area to reach data saturation. Interviews were carried out either face-to-face or over the telephone at any time that suited the parent, which provided flexibility to enable working and non-working mothers to participate. A limitation of this study is that the majority of mothers were of white ethnicity and the views of other ethnic groups were not represented. Also, mothers may have been inclined to give socially desirable responses and there was a possibility of selection bias as it may be that mothers with an interest in PA were more willing to take part in the study.

CONCLUSIONS

The data presented here suggests that mothers are not aware that PA and SB targets for the early years are set by the UK government. Awareness of these guidelines is important if mothers are to help their child meet the targets. However, as mothers do not identify with the need to increase PA or reduce SB in their child, guidelines alone are unlikely to initiate behaviour change. Providing mothers with information on how they can make a more accurate assessment of their preschool child's PA and SB levels, and information about the benefits of increased PA and reduced SB would need to go hand-in-hand with improved dissemination of the guidelines in order for them to be meaningful to mothers. Clear messages need to be developed that reframe the guidelines into pragmatic and usable targets that families can relate to and feel able to achieve.

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REFERENCES

1. Timmons BW, Leblanc AG, Carson V, *et al*. Systematic review of physical activity and health in the early years (aged 0–4 years). *Appl Physiol Nutr Metab* 2012;37:773–92.
2. Timmons BW, Naylor PJ, Pfeiffer KA. Physical activity for preschool children—how much and how? *Can J Public Health* 2007;98: S122–34.
3. Collings PJ, Brage S, Ridgway CL, *et al*. Physical activity intensity, sedentary time, and body composition in preschoolers. *Am J Clin Nutr* 2013;97:1020–8.
4. Hinkley T, Teychenne M, Downing KL, *et al*. Early childhood physical activity, sedentary behaviors and psychosocial well-being: a systematic review. *Prev Med* 2014;62:182–92.
5. Tremblay MS, Leblanc AG, Kho ME, *et al*. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *Int J Behav Nutr Phys Act* 2011;8:98.
6. Saunders TJ, Chaput JP, Tremblay MS. Sedentary behaviour as an emerging risk factor for cardiometabolic diseases in children and youth. *Can J Diabetes* 2014;38:53–61.

7. Prentice-Dunn H, Prentice-Dunn S. Physical activity, sedentary behavior, and childhood obesity: a review of cross-sectional studies. *Psychol Health Med* 2012;17:255–73.
8. Carson V, Janssen I. Volume, patterns, and types of sedentary behavior and cardio-metabolic health in children and adolescents: a cross-sectional study. *BMC Public Health* 2011;11:274.
9. Stamatakis E, Coombs N, Jago R, *et al*. Type-specific screen time associations with cardiovascular risk markers in children. *Am J Prev Med* 2013;44:481–8.
10. Ekelund U, Brage S, Froberg K, *et al*. TV viewing and physical activity are independently associated with metabolic risk in children: the European Youth Heart Study. *PLoS Med* 2006;3:e488.
11. Leblanc AG, Spence JC, Carson V, *et al*. Systematic review of sedentary behaviour and health indicators in the early years (aged 0–4 years). *Appl Physiol Nutr Metab* 2012;37:753–72.
12. Jago R, Baranowski T, Baranowski JC, *et al*. BMI from 3–6 years of age is predicted by TV viewing and physical activity, not diet. *Int J Obes* 2005;29:557–64.
13. Hinkley T, Verbestel V, Ahrens W, *et al*. Early childhood electronic media use as a predictor of poorer well-being: a prospective cohort study. *JAMA Pediatr* 2014;168:485–92.
14. Manganello JA, Taylor CA. Television exposure as a risk factor for aggressive behavior among 3-year-old children. *Arch Pediatr Adolesc Med* 2009;163:1037–45.
15. Marinelli M, Sunyer J, Alvarez-Pedrerol M, *et al*. Hours of television viewing and sleep duration in children: a multicenter birth cohort study. *JAMA Pediatr* 2014;168:458–64.
16. Garrison MM, Liekweg K, Christakis DA. Media use and child sleep: the impact of content, timing, and environment. *Pediatrics* 2011;128:29–35.
17. Australian Government, D.o.H. Move and play every day. National physical activity recommendations for children 0–5 years. (2014 15 January 2015). http://www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines#npa05
18. Tremblay M, Leblanc AG, Carson V, *et al*. Canadian physical activity guidelines for the early years (aged 0–4years). *Appl Physiol Nutr Metab* 2012;37:345–69.
19. Tremblay MS, Leblanc AG, Carson V, *et al*. Canadian sedentary behaviour guidelines for the early years (aged 0–4 years). *Appl Physiol Nutr Metab* 2012;37:370–91.
20. Education, N.A.f.S.a.P., Active Start. *A statement of physical acitvity guidelines for children from birth to age 5*. 2nd edn. American Alliance for Health, Physical Education, Recreation, and Dance, 2009.
21. Department of Health, Start Active, Stay Active. *A report on physical activity from the four home countries' chief medical officers*. London: Department of Health, 2011.
22. Tucker P. The physical activity levels of preschool-aged children: a systematic review. *Early Child Res Q* 2008;23:547–58.
23. Bornstein DB, Beets MW, Byun W, *et al*. Accelerometer-derived physical activity levels of preschoolers: a meta-analysis. *J Sci Med Sport* 2011;14:504–11.
24. Vale S, Santos R, Silva P, *et al*. Preschool children physical activity measurement: importance of epoch length choice. *Pediatr Exerc Sci* 2009;21:413–20.
25. Pate RR, O'neill JR, Mitchell J. Measurement of physical activity in preschool children. *Med Sci Sports Exerc* 2010;42:508–12.
26. Townsend N, Wickramasinghe K, Williams J, *et al*. *Physical activity statistics 2015*. London: British Heart Foundation, 2015.
27. Jago R, Edwards MJ, Urbanski CR, *et al*. General and specific approaches to media parenting: a systematic review of current measures, associations with screen-viewing, and measurement implications. *Child Obes* 2013;9(Suppl):S51–72.
28. Health Survey for England 2008. *Physical activity and fitness*. Leeds: The Information Centre, 2010.
29. Jago R, Sebire SJ, Wood L, *et al*. Associations between objectively assessed child and parental physical activity: a cross-sectional study of families with 5–6 year old children. *BMC Public Health* 2014;14:655.
30. Jago R, Sebire SJ, Edwards MJ, *et al*. Parental TV viewing, parental self-efficacy, media equipment and TV viewing among preschool children. *Eur J Pediatr* 2013;172:1543–5.
31. Jago R, Thompson JL, Sebire SJ, *et al*. Cross-sectional associations between the screen-time of parents and young children: differences by parent and child gender and day of the week. *Int J Behav Nutr Phys Act* 2014;11:54.
32. Jago R, Wood L, Zahra J, *et al*. Parental control, nurturance, self-efficacy, and screen viewing among 5- to 6-year-old children: a cross-sectional mediation analysis to inform potential behavior change strategies. *Child Obes* 2015;11:139–47.
33. Oliver M, Schofield GM, Schluter PJ. Parent influences on preschoolers' objectively assessed physical activity. *J Sci Med Sport* 2010;13:403–9.
34. Vaughn AE, Hales D, Ward DS. Measuring the physical activity practices used by parents of preschool children. *Med Sci Sports Exerc* 2013;45:2369–77.
35. Loprinzi PD, Trost SG. Parental influences on physical activity behavior in preschool children. *Prev Med* 2010;50:129–33.
36. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychology* 2006;3:77–101.
37. Ritchie Jane SL. *Qualitative data analysis for applied policy research. The qualitative researcher's companion. SAGE Publications, Inc*. Thousand Oaks, CA: SAGE Publications, Inc., 2002:305–330.
38. He M, Irwin JD, Sangster Bouck LM, *et al*. Screen-viewing behaviors among preschoolers: parents' perceptions. *Am J Prev Med* 2005;29:120–5.
39. Milton K, Bauman A. A critical analysis of the cycles of physical activity policy in England. *Int J Behav Nutr Phys Act* 2015;12:8.
40. Knox EC, Esliger DW, Biddle SJ, *et al*. Lack of knowledge of physical activity guidelines: can physical activity promotion campaigns do better? *BMJ Open* 2013;3:e003633.
41. Carson V, Clark M, Berry T, *et al*. A qualitative examination of the perceptions of parents on the Canadian Sedentary Behaviour Guidelines for the early years. *Int J Behav Nutr Phys Act* 2014;11:65.
42. Snyder LB. Health communication campaigns and their impact on behavior. *J Nutr Educ Behav* 2007;39(2 Suppl):S32–40.
43. Hesketh K, Hinkley T, Campbell K. Children's physical activity and screen time: qualitative comparison of views of parents of infants and preschool children. *Int J Behav Nutr Phys Act* 2012;9:152.
44. Walton K, Simpson J, Darlington G, *et al*. Parenting stress: a cross-sectional analysis of associations with childhood obesity, physical activity, and TV viewing. *BMC Pediatr* 2014;14:244.
45. Knowles AM, Kirk AF, Hughes AR. *Parents' perceptions of their children's sedentary behaviour*. Qualitative Research in Sport, Exercise and Health, 2015:1–17.
46. Latimer A, Brawley L, Bassett R. A systematic review of three approaches for constructing physical activity messages: what messages work and what improvements are needed? *Int J Behav Nutr Phys Act* 2010;7:36.
47. Dwyer GM, Higgs J, Hardy LL, *et al*. What do parents and preschool staff tell us about young children's physical activity: a qualitative study. *Int J Behav Nutr Phys Act* 2008;5:1479–5868.
48. Kesten JM, Jago R, Sebire SJ, *et al*. Understanding the accuracy of parental perceptions of child physical activity: a mixed methods analysis. *J Phys Act Health* 2015. doi:10.1123/jpah.2014-0442
49. Ruiz RM, Tracy D, Sommer EC, *et al*. A novel approach to characterize physical activity patterns in preschool-aged children. *Obesity* 2013;21:2197–203.
50. Hinkley T, Crawford D, Salmon J, *et al*. Preschool children and physical activity: a review of correlates. *Am J Prev Med* 2008;34:435–41.
51. Lapierre MA, Piotrowski JT, Linebarger DL. Background television in the homes of US children. *Pediatrics* 2012;130:839–46.
52. Wijtzes AI, Jansen W, Kamphuis CBM, *et al*. Increased risk of exceeding entertainment-media guidelines in preschool children from low socioeconomic background: the Generation R Study. *Prev Med* 2012;55:325–9.
53. Hinkley T, Salmon J, Okely AD, *et al*. The correlates of preschoolers' compliance with screen recommendations exist across multiple domains. *Prev Med* 2013;57:212–19.
54. Vandewater EA, shim MS, Caplovitz AG. Linking obesity and activity level with childrens television and video game use. *J Adolesc* 2004;27:71–85.
55. Kourlaba G, Kondaki K, Liarigkovinos T, *et al*. Factors associated with television viewing time in toddlers and preschoolers in Greece: the GENESIS study. *J Public Health* 2009;31:222–30.
56. Hinkley T, Salmon J, Okely AD, *et al*. Correlates of preschool children's physical activity. *Am J Prev Med* 2012;43:159–67.

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Mothers' views of their preschool child's screen-viewing behaviour: a qualitative study

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Abstract

Background: Research on screen-viewing in preschool children has predominantly focused on television viewing. The rapid development of mobile devices (e.g. tablets, smart phones and e-readers) and the increase in their use by preschool children means there is a need to understand how and why these devices are used by this age group. The aim of this study was to explore mothers' views of their preschool children's screen viewing behaviour (including mobile devices) and investigate how preschool children use different screen-viewing devices.

Methods: One-to-one, semi-structured interviews with mothers of preschool children (aged between 2 and 4 years old). Mothers were recruited through preschools, nurseries, and mother and toddler groups located within four areas of varying socio-economic status within Bristol, UK. Data were analysed thematically using a framework approach.

Results: Twenty-six mothers were interviewed. Mobile devices were regularly used as a form of screen-viewing for most children but were used on an ad hoc basis rather than being a habitual activity. The reasons and influences of mobile device use described by mothers were similar to that of television viewing. However, the portability of mobile devices meant that they were often used outside of the home as a distraction tool. Their multi-functionality meant that they could be used as a portable television, or for purposeful learning through educational games and applications. Some mothers showed concerns over mobile device use by their child, whilst others felt it was an important and useful educational tool. Although the majority of mothers felt they needed to set rules and restrictions for mobile device use, many mothers felt that they are also a necessary and unavoidable part of life.

Conclusions: Mothers in this study suggested that mobile device use by preschool children is common. More research is needed to determine the impact of mobile device use in preschool children, how much time preschool children spend using mobile devices and which activities their use may be replacing.

Keywords: Preschool child, Parenting, Screen-viewing, Sedentary behaviour, Qualitative research

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Background

For preschool children, screen-viewing mainly consists of television viewing but also includes computer use and, increasingly, the use of touchscreen mobile devices [1]. The current information on the associations between television viewing and health outcomes among young children is mixed. For instance, it remains unclear if television viewing is associated with overweight and obesity [2–9], and poorer or improved academic skill development [4, 10, 11] in young children. There is evidence of associations between television viewing and lower levels of physical activity [4, 12], shorter sleep duration [13–15], adverse dietary outcomes [4, 16], and poorer well-being outcomes [17] in young children. In general, however, more work is needed to understand these associations and particularly the extent to which associations could be explained by other factors such as such as parental sedentary habits [18]. Because screen-viewing is one of the few easily modifiable sedentary behaviours in preschool children, it is often targeted within interventions to reduce sedentary time.

In the UK, there are no specific government guidelines of daily screen-viewing time for young children, only that screen-viewing should be minimised [19]. The Australian [20] and Canadian [21] guidelines suggest that children between 2 and 5 years of age should have less than 1 h of screen-viewing time per day. The American guidelines have recently been revised to suggest that screen-time should be monitored and minimised without giving a specific recommended time limit [22].

Mobile devices, such as smart phones and tablets, are easily and intuitively used by very young children and provide an instant interactive element that appeals to both children and parents [1]. There are little data published that identify how much time preschool children engage with mobile devices in the UK. However, studies have reported that television viewing in preschool children is high. For example, a UK survey of 252 parents showed that two-thirds of 3 to 5 year olds were watching two or more hours of television per day [23]. A US survey with parents of children aged 0 to 8 years old reported that children's access to mobile devices had increased from 52 % in 2011 to 75 % in 2013 [24]. In addition, children were watching less television per day (57 min in 2013 compared with 69 min in 2011) and spending more time using mobile devices (15 min in 2013 compared with 5 min in 2011), indicating that there has recently been a shift in screen-viewing behaviours and mobile devices are becoming more prominent in young children's lives.

Parents greatly influence the screen-viewing behaviours of young children and act as 'gatekeepers' to the amount of screen-time and the type of devices children have access to [25]. This influence may come from parents role-modelling screen-viewing behaviours [23, 26–29], the media equipment parents provide their children [23, 28], parents' attitudes to screen-viewing (e.g. belief it is a positive or negative behaviour) [28, 30], and the rules or limits parents set on screen-viewing [23, 31, 32].

Parents' perspectives of their preschool child's screen-viewing have been explored in qualitative studies [25, 33–36]. However, as most of these studies were conducted before the availability of mobile devices, they have tended to focus on only television viewing. These studies report that parents believe television viewing for preschool children is acceptable in moderation and if appropriately balanced with other activities [25, 33, 34, 36]. They suggest parents are happy with their children's television viewing time [34–36]. Parents perceive television viewing to have many benefits, e.g. its educational influence [25, 33–36], its ability to calm children and help them relax [34–36], as a distraction tool to allow parents to do household tasks [25, 33–36], and as a behaviour management tool [35, 36]. However, some parents have concerns over the impact of television on their child, including the influence of inappropriate content and advertising [34, 36], adverse health outcomes [34, 36], its negative impact on behaviour and mood [25, 34, 36], impact on social skills [33, 34], and its addictive nature [25, 33]. Yet, it appears that these concerns over television viewing are not perceived to outweigh its benefits, with majority of parents in these studies reporting that they encouraged television viewing for their preschool child.

There is a paucity of research available about parents' perspectives of newer technologies such as catch-up television (where selected programmes are automatically saved to watch later), internet television (which allows for programmes and video content to be viewed via the internet though video streaming technology), and mobile devices. A recent study by Carson et al. [33] looked at parents' reactions to the Canadian sedentary behaviour guidelines, in which parents included mobile devices in their discussions. Parents felt that tablets and smartphones were useful distractions and educational tools, and thought their children found them very alluring. This indicates that parents view these devices in a similar way to television viewing. As television, computer and mobile device use are all termed as screen-viewing, it is important to understand if they are used by parents and children in the same way.

Considering the rise in accessibility to mobile devices and the continual advances in this type of technology, a more comprehensive understanding of how they are used by preschool children is needed. Furthermore, there is a need to break away from solely examining television viewing and begin to explore parents' attitudes to

these newer devices and investigate the factors that influence their use. This study aimed to explore mothers' views of their preschool children's screen viewing behaviour (including mobile devices) and investigate how different screen-viewing devices are used by preschool children.

Methods

In-depth, semi-structured interviews were held with mothers of preschool children in order to explore their views of their children's screen viewing behaviours. The study was approved by the University of Bristol, Faculty of Medicine and Dentistry ethics committee. GFB, a female PhD student who has experience and training in qualitative research, carried out the recruitment and data collection.

Recruitment and sampling

To ensure socioeconomic and urban diversity in the sample, mothers were recruited within low, medium, and high-socio-economic status (SES) areas, within the City of Bristol, and one rural community (mid SES) located 13 km outside the city centre. SES was defined by thirds of the 2010 index of multiple deprivation (IMD) [http://data.gov.uk/dataset/index-of-multiple-deprivation] which is an area based measure of deprivation associated with the residential postcode.

Mothers were approached via children's centres, day nurseries, preschools, and mother and toddler groups running in the four targeted areas. Fourteen centres were approached for recruitment. Of these, 8 allowed face-to-face recruitment with mothers and a further three allowed information to be given to mothers via centre staff. For locations allowing face-to-face recruitment, posters and leaflets about the study were displayed for at least one week before GFB attended to recruit mothers. During face-to-face recruitment, GFB explained the reasons for the study and asked mothers if they would be willing to take part in a one-to-one interview. Mothers were eligible to take part if they could speak English and had a child that was between 2 years old and about to commence formal schooling (between 4 and 5 years). Only mothers were recruited for this study, as mothers tend to be the main caregiver.

All eligible participants received a study information sheet before signing a consent form. Consent forms were received from 34 mothers (9 from high SES, 8 from mid SES, 7 from low SES and 10 from the rural area). Thirty-two of these women agreed to take part when approached during face-to-face recruitment, and two contacted the researcher having read the information sheet. GFB contacted the mothers by telephone to arrange the interview, at which point three mothers dropped out of the study (1 high SES, 2 rural). Interviews were arranged at a time and place that was convenient for the mother. Those who were unable or unwilling to meet face-to-face were offered the option of a telephone interview. A further four participants did not turn up to interview (2 low SES, 1 mid SES, 1 rural).

Data collection

GFB conducted 26 interviews in total. Ten interviews were conducted in the mothers' home, three within the location of recruitment (i.e. children's centre), and 13 over the telephone. The mothers' child was present within 9 of the interviews. Interviews lasted between 23 and 67 min (mean 45 min). Twenty-two interviews were held between April and June 2013. A further four were undertaken 11 months later in order to reach data saturation, i.e. no new themes emerged from the analysis. The time delay in conducting these four interviews was due to GFB being on maternity leave. Data collection and analysis were undertaken concurrently, so that themes from earlier data collection could inform the focus of later interviews and to determine when data saturation had been reached. A semi-structured topic guide was used to ensure consistency across the interviews. This paper focuses on questions around mothers' views of their preschool child's screen viewing behaviours (Table 1). A summary of the interviews were discussed with participants after each interview to ensure the researcher interpreted and captured their views as intended.

Data analysis

Interviews were audio recorded, transcribed verbatim and anonymised. Field notes were made by GFB immediately following each interview. The data were analysed thematically [37]. This entailed reading and re-reading the interview transcripts to gain an understanding of the mothers' views. GFB and KMT independently read a sample of transcripts to identify potential codes that could be applied to the data, which they then discussed and which subsequently

Table 1 Questions around mothers' views of their preschool child's screen viewing behaviours

1. Please can you tell me about yourself and your family?
   Probe: who lives with you, what ages are your children, do you and your partner work, what sorts of things do you do together as a family?
2. Can you talk me through a typical week for [child's name]?
3. So thinking about your preschool child, tell me a bit about him/her - What type of play does your child have a preference for? (E.g. crafts, rough and tumble, imaginary play, watching TV or DVDs?)
4. What do you think about the TV as an activity for preschools children?
   Probe: What types of programmes they watch? How long they watch it for? Who with? What are the pros and cons of watching TV?
5. Does [child's name] play with/use any electronic media devices such as computers, laptops, tablets, smartphones, or games consoles?
6. What are your views on these devices for preschool children?
   Probe: When/how do they use them? Who with? Any pros and cons?

provided the basis for a coding frame. Once an initial coding frame had been developed, GFB and KMT independently coded a sample of transcripts. Any discrepancies between their coding were discussed. These discussions led to the coding frame being revised, with new codes being added and some codes being removed or defined more clearly. Once the coding frame had been finalised, transcripts were imported into NVivo (version 10.0, QSR, Southport, UK) to allow electronic coding and retrieval of data. Once the data had been fully coded, data coded under specific codes were retrieved and overarching or central themes identified. To assist with the systematic interpretation of the data, an approach based on framework analysis [38] was then used. This entailed summarising data pertaining to specific codes in tables. Comparisons were then made within and across the interviews. The reporting of qualitative research in this paper is in accordance with the Standards for Reporting Qualitative Research (SRQR) checklist [39]. Quotes reproduced in this paper have been tagged with the interview number, whether the interviewee resided in the low, medium or high SES, or the mid SES rural location, and the sex and age of their preschool child.

Results

Details of participants interviewed are provided in Table 2. Three of the mothers had two children of preschool age, in which case both children were discussed in the interview. Results are presented below under four main headings: how different devices were used; reasons for screen-viewing; mothers' attitudes towards screen-viewing; influences of screen-viewing. Screen-viewing devices are amalgamated into three groups: television (includes televisions and DVDs); computer (includes personal computers (PC), laptop computers, and child version computers); mobile devices (includes tablets, smartphones, e-readers and child version tablets). Table 3 summarises the results and provides a comparison between these three groups of screen-viewing devices in relation to the four headings described above.

Table 2 Participant characteristics ($N = 26$)

	Number	Percent
Area of recruitment		
Low-SES	5	19.2
Mid-SES	7	26.9
High-SES	8	30.8
Rural Mid-SES	6	23.1
Mothers details		
Lone parent	4	15.4
Mothers employment		
None	16	61.5
Part-time	6	30.8
Full-time	2	7.7
Child details		
Child age (years)		
2	4	13.8
3	15	51.7
4	10	34.5
Child sex		
Female	11	37.9
Male	18	62.1
Only child		
Yes	6	23.1
No	20	76.9

How different devices are used

Mothers mentioned a number of screen-viewing devices that their preschool children had regular access to. These included television, DVD player, laptop computer, PC, games console (e.g. Xbox or PlayStation), tablet, smartphone, and children's computer or tablet (e.g. VTech). All but one mother owned at least one television. The mother who did not own a television said that her preschool child would watch catch-up television from a laptop. All mothers mentioned that their child had access to a smartphone. Their child's use of a computer (PC or laptop) was less frequently mentioned.

Televisions, computers and mobile devices were used in different contexts. For example, television was usually watched within set time periods that often coincided with times that the mother needed to be doing something elsewhere, such as getting ready in the morning and cooking dinner in the evening. Mobile devices tended to be used more frequently than computers but not at set times.

Dedicated children's channels appeared to be the main source of television programmes that children watched (some mentioned family shows at the weekend and DVDs), and channels with no adverts were preferred. Many mothers said that they used catch-up television or recorded programmes so that children could watch a particular programme when they wanted to. This also gave parents control so they could only watch the programmes they felt to be appropriate. Most children required their parents' permission to watch television. However, some mothers allowed the television to be on in the background all day. Generally the television was watched by children independently or with a sibling, although some mothers mentioned watching with their child or as a family.

Table 3 Summary of results and comparison of devices. An item is checked where it had been reported by at least one mother

	Television	Computer	Interactive media
How and why devices are used			
Set/regular time of day/week	✓		
Ad hoc times of day/week		✓	✓
Parent permission only	✓	✓	✓
Free access	✓		✓
Specific content chosen by parent	✓	✓	✓
Free play			✓
Independently	✓		✓
With family members	✓	✓	✓
Supervision needed		✓	
No supervision needed	✓		✓
Reasons for use			
For child to rest	✓		✓
Education		✓	✓
Babysitter	✓		✓
To calm child, prevent negative behaviour	✓		✓
Used as a punishment/reward	✓		✓
Family time	✓		
Computer skills / school ready		✓	✓
Distraction tool outside of the home			✓
Mothers attitude towards screen-viewing			
+ Educational	✓	✓	✓
+ Acceptable in moderation and balance	✓	✓	✓
+ Valuable behaviour management tool	✓		✓
+ Important skill development for child		✓	✓
-Concerns about unsuitable content	✓	✓	✓
-Concerns about addictive nature	✓		✓
-Concerns about change in behaviour	✓		✓
-Concerns over sedentary nature	✓		✓
-Concerns about solitary nature/ social skill development			✓
-Feelings of needing to use screen viewing rather than wanting to	✓		✓
Influences of screen viewing			
Child's engagement to device	✓	✓	✓
Siblings	✓	✓	✓
Fathers	✓	✓	✓
Mothers' childhood experience	✓	✓	

"We tend to do a lot of iPlayer catch up. So we know what they're watching." P32, Mid SES, Girl, age 4

"I have a preference for CBeebies (BBC Children's channel) so there's no adverts because I can't abide them." P36, High SES, Boy, age 4

Computer use was primarily facilitated by a parent or sibling and was seldom used in isolation. This was mainly because children lacked mouse control and computer skills at this age. Most commonly, the purpose of computer use was to play educational games and videos. Some mothers mentioned that their preschool child would also watch or participate in computer games with their older sibling just for fun.

The multi-modality of mobile devices meant they tended to be used in varying ways (i.e. watching programmes and films, playing games, educational applications (apps) and taking and looking at photos). Sometimes these devices were used with parent participation (usually a tablet), especially educational games and apps. More often, however, they were used by the child in isolation, either when the child requested it or when it had been given to the child by their parent. Access to mobile devices varied greatly. For instance, some mothers felt a need to 'protect' their child from their smart phone, while one mother mentioned that her children had free reign to her smart phone.

"No I don't let them have access, we don't want them to be having access all the time (smartphone), I just don't like it." P35, High SES, 2 boys, ages 2 &3

"Yeah they have access to my iPhone all the time, when they get hold of that and I can't find it anywhere..." P28, Mid SES Rural, Boy, age 4

Some mothers mentioned providing their child with their own mobile device (e.g. iPad or iPod touch) from a young age (i.e. 18 months to 2 years) to provide their child with a form of entertainment and education.

Reasons for screen-viewing

Mothers gave a range of reasons for why they allowed their child to screen-view. All the mothers said that screen-viewing was a good way for their child to rest, relax or have some quiet time. This screen-viewing mostly consisted of television viewing, although some mothers talked about giving their child a tablet or smartphone to play games or watch programmes on as a means of downtime. Screen-viewing was also encouraged by mothers when they felt their child getting too wound up or excited, to calm the child down and prevent disruptive behaviour. Again, television was the

predominant device used. As mobile devices provides portable access to television programmes, these were also used for this reason.

"She had an absolute meltdown about it and I just thought you need 20 min in her room. I put her in bed and I gave her my phone, and I let her watch Peppa Pig." P32, Mid SES, Girl, age 4

Screen-viewing was not the only activity mothers encouraged for down-time, some mothers (all from the high SES area) also mentioned they encouraged their child to read, do puzzles, crafts, listen to music, or play quietly on their own.

Mothers described how they refused their child screen-viewing time (predominantly television) as a punishment for bad behaviour and provided screen-viewing time (predominantly mobile devices) as a reward for good behaviour.

"Yes it's also a good tool to bribe them with, like if you do this, that and the other, you can get to use the iPad." P13, Mid SES, Boy, age 4

Often the reason for the child's screen-viewing was to benefit the mother. For example, some mothers encouraged their child to screen-view when they wanted to do some household tasks, so they could sleep longer in the morning, or if they need to have a break from the child. Television was most commonly used in this instance, although mobile devices were also often mentioned.

"I think sometimes it's not just the need for them to physically stop but I kind of feel the need for them to mentally stop as well, if that makes sense... Um, and even if they are colouring they're, you know, um, I get exhausted by being with them sometimes." P36, High SES, Boy, age 4

"Like my older children have got iPads and, you know, he's quite able to sit quietly and play on one of those as well, like games and things like that." P53, Mid SES Rural, Boy, age 3

The portable nature of mobile devices meant they could be used as a convenient and effective distraction for children in situations that required them to be patient and/or quiet outside of the home. For example, waiting for an appointment or when travelling in the car.

"Erm just kind of if we were travelling or something like that she normally uses it erm the other day we went to the dentist and we took it with us because it's quite useful to kind of you know while she's waiting for us to have our teeth done kind of thing. They're portable it's so useful isn't it?" P10, Low SES, Girl, age 3

Television can be an opportunity for family time and closeness between family members. For example, mothers described cuddling with their child whilst watching television or a film, and described this as something that benefited both them and their child. This was not mentioned with other screen-viewing devices.

All mothers felt that screen-viewing provided a valuable educational opportunity. Children's television programmes were thought to help children with language development, academic attainment and general knowledge. However, this appeared to be a consequential benefit of watching television and not the primary reason. Mothers described using computers to help their child's learning (e.g. reading, letters, numbers, colours etc.) through games and videos. Games available on mobile devices were often seen as a fun, accessible and an easy way for mothers to help their children learn, and were mentioned by most mothers.

"She knows her alphabet pretty well and I'm absolutely sure that's from an app where she has to match up and it says the letter she matches up and erm...."P34, High SES, Girl, age 3

Some mothers felt that developing computers and/or touchscreen skills were important for their child. This was mainly because they were aware that their child would be using these devices in school and wanted them to have a head start or feared that they would be behind if they did not have computer skills. Some mothers commented that computer use was an important component of modern life, and that children should be encouraged to understand and use it from an early age. One mother from the low SES area said that she did not feel that it was relevant for children to learn about technology until they were school age.

"I think it's important as well because obviously computers that's ... that's life isn't it, that's modern. It's no good him starting school not having used a computer and not having used a mouse because like even in Reception and Year 1 they're using computers." P39, Low SES, Boy, age 3

"I don't know how useful it is for a pre-schooler, does that make sense? Whereas until he starts school and he starts however they learn they need to see it, try it, do it, get it right rather than sit down now." P45, Low SES, Boy, age 3

Mothers' attitudes towards screen-viewing

Often computer and mobile device use were described as more positive forms of screen-viewing than television viewing because they were less passive and required children to engage in activities. However, mothers also felt that mobile device use was a more solitary activity for children and therefore detrimental to social development, whereas television viewing was more inclusive and provided more opportunity for discussion.

Many mothers portrayed a sense of wonderment at their children's ability to use mobile devices (mostly mothers from the high SES area). They found it rewarding to see their young child being competent at a skill. Some felt a sense of bemusement that their child used these devices so instinctively when they themselves did not feel so competent.

> *"Technologically I think they're amazing because they're actually so much better than we are, things on the computer and I'm like I haven't even taught you how to do that, she's like no, no but I know if I press this button." P14, High SES, Girl, age 4*

Many mothers were concerned about their perceived negative effects of screen-viewing, this was often regarding the content of the screen-viewing rather than length of screen time. For instance, some mothers (mostly mothers of boys) felt that some children's television programmes and computer games may be a negative influence and encourage bad behaviour or violence. Many mothers talked about changes in their child's behaviour when they screen-viewed, including their child being slower, having less energy or 'zoning out'. This was predominantly relating to television viewing but also included mobile devices. Some mothers talked about the addictive nature of screen-viewing and were concerned that their child would form habits that would continue into older childhood and the teenage years. Only a few mothers mentioned concerns over the sedentary nature of screen-viewing. Typically, the educational value (especially with interactive devices) and the need for the parent to keep the child occupied, outweighed any concerns mothers had with screen-viewing. Some mothers did not like their child screen-viewing but felt a sense of resignation that they needed to use it as a tool to 'babysit' their child.

> *"Well, we have in the house, we have sort of iPads and things like that, and I think too much of it is just… It zones them out, and you just can't get any conversation out of them."P28, Mid SES Rural, Boy, age 4*

> *"I think it's one of those that's probably easier, it's very, I don't like them to watch too much TV, I don't like the thought that they're just sat here watching something but I think practically sometimes it's just, well it is an easy option but I still, and I do do it at times but I don't like doing it and I wouldn't, I wouldn't want to do it." P13, Mid SES, Boy, age 4*

Influences of screen-viewing

A child's preference for screen-viewing appeared to influence the amount of screen-time allowed. Many mothers described the strong desire from their child to use mobile devices, and often parents felt they needed rules and restrictions in place to manage children's demands for their use. These included hiding devices, only being able to use devices in their fathers' presence and with his permission, pass-coding devices, and time limiting use. However, it appeared that some of these children may still spend long periods using mobile devices and what mothers felt was 'too much' screen-viewing varied. For instance, although one mother described restricting her child's use of the family tablet, she also allowed the child to use the device for up to two hours in one session. Some mothers mentioned that their child would have tears and tantrums when a screen-viewing device was taken away, which mothers described as difficult to manage.

> *Mother: "We've got them pass coded [iPad]. They can't pick it up without our permission."*
>
> *Interviewer: "And how long would you let him use it for?"*
>
> *Mother: "I guess not really much more than two hours"P55, Rural, Boy, age 4*
> *"He does love it and he would ask for it and once he's playing it's difficult to encourage him not to. It would be difficult to get him off that onto another activity, difficult to upgrade from his favourite game." P31, High SES, Boy, age 4*

Contrary to this, some mothers felt that their child did not need restrictions on screen-viewing in order to prevent extended periods of viewing. For instance, some mothers explained that their child did not have the attention span for extended periods of television viewing and could only watch 15 to 30 min of television before they moved onto something else. In addition, some mothers who allowed their child to have free access to mobile devices found that after an initial enthusiasm for the device (e.g. a couple of months) their interest in it wore off and they would naturally choose other activities to do, such as playing with toys over screen-viewing.

"In fact he's not used the iPad for a few months now. He's not needed it, he's been quite happy playing by himself with his toys. I've not thought about it and he's not asked for it." P41, Mid SES Rural, Boy, age 3

Family members also influenced the preschool child's screen-viewing behaviours. Some preschool children were described as taking an interest in what their older sibling was doing on a computer, watching or participating with their sibling. Some mothers said that their older child would teach their preschool child how to use the computer and play games with them. It also seemed that preschool children with older siblings were exposed to television programmes and computer games aimed at older children.

"The big thing which again he's probably quite young to be doing is Minecraft. Which is a horrible build game. So he'll do that, but again that's his older brother influencing him." P55, Mid SES Rural, Boy, age 4

Some mothers described their child's father encouraging screen-viewing as a way of interacting with their child. A few mothers described this with some contention, as this behaviour went against their desire to restrict screen-viewing. These mothers said that their child's father had different views towards screen-viewing (especially mobile devices) than themselves, where they felt fathers believed that there was no need for restriction because screen-viewing was harmless, fun, and important for skill development.

"It's a bone of contention because he can't see the problem with it… he's opinion is its just fun and it's good and it does give you skills." P34, High SES, Girl, age 3

Mothers' own childhood experiences appeared to influence how they felt about screen-viewing. For example, one mother grew up with very little technology and wanted her child to enjoy an equally active lifestyle. Whereas another mother grew up with the televsion on all the time and felt that this was a positive experience because it stopped it being a novelty and she carried this through with her son.

"Oh we've always got the TV on, it's pretty much always on because when I grew up the TV was always on, and it's not a novelty at all… he won't really sit down and watch it, it's just always on." P39, Low SES, Boy, age 3

Discussion

Television viewing was the main form of screen-viewing discussed by mothers in this study and appears to be the main form of screen-viewing for their preschool child. Analysis of the data, however, shows that preschool children frequently have access to mobile devices. How the preschool children use this form of screen-viewing often overlaps with how they use television viewing and computers. There also appeared to be some differences in their use. For instance, unlike computers, mobile devices allow for independent play which means mothers are able to use them in a similar way to the television (e.g. as a babysitter, independent quiet time). Mothers feel that mobile devices have a purposeful and interactive educational value and are often viewed positively. Mobile devices seemed to be used at ad hoc times when its use was required, rather than regular periods of the day, which was the case with television viewing, indicating its use may not be habitual at this age.

Qualitative studies have reported mothers' reasons for their preschool children's television viewing. For instance, as a way for children to rest [34–36], to use as an electronic babysitter [25, 33–36] and as a behaviour management tool [35, 36]. These reasons for television viewing were confirmed in this study but were also given for mobile devices use. In addition to these reasons, computers and mobile devices are used as an educational tool to facilitate learning by using educational games. Apps on mobile devices for preschool children are often promoted as educational. It appears to be commonplace for schools and educational and parenting websites to recommend educational apps to use with preschool children, thereby promoting their use as an educational tool (e.g. [40, 41]). The use of touch-screen devices as a tool for learning in preschool settings is reported to stimulate concentration and motivation for literacy activities, and provide opportunities for communication and interaction, independent learning and feelings of achievement in young children [42]. Within the home, a study of 106 3–5 year olds reported that the use of educational apps have been associated with higher letter sound and name writing skills but time on tablets was not associated with emergent literacy skills [43]. More research is needed on the potential role of touch-screen devices on learning in the early years. It is likely that the quality of the experience with touch-screen devices is more important for effective learning than duration using them [43].

A unique difference between mobile devices and other screen devices is their portable nature, which means that screen-viewing can take place outside of the home and can provide a means to distract the child in situations that require them to be patient (e.g. car journeys and medical appointments). Radesky et al., [44] observed

mobile phone use by parents and children in fast-food restaurants, and reported that parents often gave their young children a mobile phone in order to distract or pacify them if they were becoming active or disruptive. It has been speculated that this reliance on mobile devices to counteract boredom may inhibit a child's ability to self-regulate their behaviour [1], and the use of mobile devices in this way may inhibit important interaction opportunities [44], but currently there is little research to substantiate this.

Some mothers in this study, used mobile devices (especially smartphones) with caution and felt their allure to children difficult to manage. They also showed concerns about their accessibility, the child's behaviour that mothers feel result from use of mobile devices, and the perceived possibility that screen-viewing might have a negative effect on their child. However, many of these mothers felt that mobile devices were now a necessary and unavoidable part of life and allowed their child to use them regularly with some reluctance. Similarly, Carson et al. [33], reported that Canadian mothers of preschool children had some reservations about using screen-viewing as a babysitter but could not think of any viable alternatives. In contrast, some mothers in this study do not show concerns over screen-viewing for their child and support its use, this includes television viewing, computer use and mobile device use. For television viewing it seems that this is because there is no perceived harm in watching it, whereas mobile devices and computer use is encouraged for educational purposes. A qualitative study in six European countries concluded that parents do not have concerns over their child's television viewing or computer use, however their views on mobile devices were not reported [34]. Nevertheless, most (but not all) mothers in this study felt the need for rules and restrictions to manage their child's screen-viewing. This is consistent with findings from a quantitative study in Canada that reported 81 % of parents of 3 year olds had household rules for screen time [32].

It is clear that mobile devices provide an intuitive, responsive and interactive component that other screen viewing devices cannot provide. Research has not yet ascertained as to whether mobile device use can be defined in the same way as television viewing, and if perhaps, its use should be evaluated as a separate behaviour. However, it is important to note that, although these screen-viewing devices vary in the way they are used, they all may still be considered a sedentary activity. As sedentary behaviour in young children is associated with negative health outcomes, it is important that their use is still minimised. This study shows that mothers regularly provide mobile devices for their preschool children and highlights the need for further research to determine the impact of its use in young children. It is not known how much time preschool children spend with these devices and further research is need to establish whether mobile device use is replacing an alternative sedentary activity (such as television viewing or reading books) or other (physically active) activities. In addition, this study indicates differences between mothers and fathers views on screen-viewing, and that fathers influence their preschool child's screen-viewing behaviour. Therefore, further research should be carried out to explore fathers' views and influences of screen-viewing in preschool children.

The results of this study indicate that health policy and interventions aimed at reducing sedentary behaviour in young children need to be sensitive to the needs and priorities of parents and take into the account the reliance that parents have on screen-viewing devices. A qualitative study by Evans et al., reported that parents felt reducing television viewing in their 6 to 7 year old children would cause conflict in the home and require resources (e.g. financial and time) that they were unsure they could provide,[45]. This highlights the potential stress parents may be placed under when asked to change their child's screen-viewing behaviour.

Strengths and limitations

The interviews were held with a diverse sample of mothers, i.e. individuals from different SES areas, which included both urban and rural areas, working and non-working mothers, and lone-parents. However, the extent to which the findings can be generalised will be limited by the fact that the majority of the interviewees were white British. As mothers were aware of the nature of the research (i.e. investigating mothers' views of their preschool child's physical activity and sedentary behaviour) they may have been inclined to give socially desirable responses. As we do not have information on the age of the mothers in this sample, we are unable to comment on the generation from which the mothers belong or the extent to which their views are affected by the nature of their own screen-viewing as a child. Another limitation is that this study is based on interviews rather than observations, and so reports mothers' perceptions of their child's behaviour, rather than directly recording it.

Conclusion

Mobile devices use is common in preschool children, although it does not appear to be a habitual behaviour. Their multi-functionality means that they may be used for independent play in the same way as television viewing (e.g. as a babysitter, independent quiet time), or more purposefully for learning through games and through computer skill development. A unique characteristic of mobile devices is its portability, meaning that

screen-viewing can take place outside of the home. Although mothers expressed concerns over mobile devices use, they were generally viewed it more favourably than television viewing. The majority of parents had rules and restrictions to limit their child's use of mobile devices. However, the strong allure of mobile devices to preschool children makes restricting their use problematic.

Abbreviations
AAP, American Academy of Paediatrics; App, mobile devices application; IMD, index of multiple deprivation; PC, personal computer; SES, socioeconomic status, UK, United Kingdom

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Availability of data and materials
The dataset supporting the conclusions of this article will not be shared publicly, due to information contained within the interviews that could be linked to participants.

Authors' contributions
GFB conducted the study and drafted the paper. KMT assisted with the thematic analysis. KMT and RJ were involved in the design of the study and contributed to the drafting of the paper. All authors provided critical revisions to the manuscript, read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

Consent for publication
Not applicable.

Ethics approval and consent to participate
Ethical approval was granted for this study by the University of Bristol, Faculty of Medicine and Dentistry ethics committee. All participants taking part in this study provided informed consent. Consent for the publication of data was provided by participants.

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References
1. Radesky JS, Schumacher J, Zuckerman B. Mobile and interactive media use by young children: the good, the bad, and the unknown. Pediatrics. 2015; 135(1):1–3.
2. te Velde SJ, van Nassau F, Uijtdewilligen L, van Stralen MM, Cardon G, De Craemer M, Manios Y, Brug J, Chinapaw MJM, ToyBox-study g. Energy balance-related behaviours associated with overweight and obesity in preschool children: a systematic review of prospective studies. Obes Rev. 2012;13:56–74.
3. Cox R, Skouteris H, Rutherford L, Fuller-Tyszkiewicz M, Dell' Aquila D, Hardy LL. Television viewing, television content, food intake, physical activity and body mass index: a cross-sectional study of preschool children aged 2–6 years. Health Promot J Austr. 2012;23(1):58–62.
4. Pagani LS, Fitzpatrick C, Barnett TA, Dubow E. Prospective associations between early childhood television exposure and academic, psychosocial, and physical well-being by middle childhood. Arch Pediatr Adolesc Med. 2010;164(5):425–31.
5. Jackson DM, Djafarian K, Stewart J, Speakman JR. Increased television viewing is associated with elevated body fatness but not with lower total energy expenditure in children. Am J Clin Nutr. 2009;89(4):1031–6.
6. Mendoza J, Zimmerman F, Christakis D. Television viewing, computer use, obesity and adiposity in US preschool children. Int J Behav Nutr Phys Act. 2007;4:44.
7. Jago R, Baranowski T, Baranowski JC, Thompson D, Greaves KA. BMI from 3–6 y of age is predicted by TV viewing and physical activity, not diet. Int J Obes. 2005;29(6):557–64.
8. Rey-Lopez JP, Vicente-Rodriguez G, Biosca M, Moreno LA. Sedentary behaviour and obesity development in children and adolescents. Nutr Metab Cardiovasc Dis. 2008;18(3):242–51.
9. Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. JAMA. 1999;282:1561–7.
10. Pagani LS, Fitzpatrick C, Barnett TA. Early childhood television viewing and kindergarten entry readiness. Pediatr Res. 2013;74(3):350–5.
11. Wright JC, Huston AC, Murphy KC, St. Peters M, Piñon M, Scantlin R, Kotler J. The relations of early television viewing to school readiness and vocabulary of children from low-income families: the early window project. Child Dev. 2001;72(5):1347–66.
12. Taverno Ross S, Dowda M, Saunders R, Pate R. Double dose: the cumulative effect of TV viewing at home and in preschool on children's activity patterns and weight status. Pediatr Exerc Sci. 2013;25(2):262–72.
13. Marinelli M, Sunyer J, Alvarez-Pedrerol M, Iniguez C, Torrent M, Vioque J, Turner MC, Julvez J. Hours of television viewing and sleep duration in children: a multicenter birth cohort study. JAMA Pediatr. 2014;168(5):458–64.
14. Magee C, Caputi P, Iverson D. Lack of sleep could increase obesity in children and too much television could be partly to blame. Acta Paediatr. 2014;103(1):e27–31.
15. Magee CA, Lee JK, Vella SA. Bidirectional relationships between sleep duration and screen time in early childhood. JAMA Pediatr. 2014;168(5):465–70.
16. Ford C, Ward D, White M. Television viewing associated with adverse dietary outcomes in children ages 2–6. Obes Rev. 2012;13(12):1139–47.
17. Hinkley T, Verbestel V, Ahrens W, Lissner L, Molnar D, Moreno LA, Pigeot I, Pohlabeln H, Reisch LA, Russo P, et al. Early childhood electronic media use as a predictor of poorer well-being: a prospective cohort study. JAMA Pediatr. 2014;168(5):485–92.
18. Carson V, Stearns J, Janssen I. The relationship between parental physical activity and screen time behaviors and the behaviors of their young children. Pediatr Exerc Sci. 2015;27(3):390–5.
19. Department of Health. Start active, stay active: a report on physical activity from the four home countries' chief medical officers. London: Department of Health; 2011.
20. Move and play every day. National physical activity recommendations for children 0-5 years. [http://www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines#npa05]. Accessed May 2015.
21. Carson V, Tremblay M, Spence J, Timmons B, Janssen I. The Canadian sedentary behaviour guidelines for the early years (zero to four years of age) and screen time among children from Kingston, Ontario. Paediatr Child Health. 2013;18(1):25–8.
22. Brown A, Shifrin DL, Hill DL. Beyond 'turn it off': How to advise families on media use. In: AAP News. vol. 36. Illinois, USA: American Academy of Pediatrics; 2015.
23. Jago R, Sebire SJ, Edwards MJ, Thompson JL. Parental TV viewing, parental self-efficacy, media equipment and TV viewing among preschool children. Eur J Pediatr. 2013;172(11):1543–5.
24. Rideout V. Zero to eight: children's media use in America 2013: a common sense media research study. 2013.
25. Knowles A-M, Kirk AF, Hughes AR. Parents' perceptions of their children's sedentary behaviour. Qual Res Sport, Exercise Health. 2015;7:1–17.
26. Jago R, Thompson JL, Sebire SJ, Wood L, Pool L, Zahra J, Lawlor DA. Cross-sectional associations between the screen-time of parents and young children: differences by parent and child gender and day of the week. Int J Behav Nutr Phys Act. 2014;11:54.
27. Jago R, Fox KR, Page AS, Brockman R, Thompson JL. Parent and child physical activity and sedentary time: do active parents foster active children? BMC Public Health. 2010;10:194.
28. Jago R, Sebire SJ, Lucas PJ, Turner KM, Bentley GF, Goodred JK, Stewart-Brown S, Fox KR. Parental modelling, media equipment and screen-viewing among young children: cross-sectional study. BMJ open. 2013;3(4):e002593.

29. Atkin AJ, Corder K, van Sluijs EM. Bedroom media, sedentary time and screen-time in children: a longitudinal analysis. Int J Behav Nutr Phys Act. 2013;10:137.
30. Bleakley A, Piotrowski JT, Hennessy M, Jordan A. Predictors of parents' intention to limit children's television viewing. J Public Health (Oxf). 2013; 35(4):525–32.
31. Jago R, Wood L, Zahra J, Thompson JL, Sebire SJ. Parental Control, Nurturance, Self-Efficacy, and Screen Viewing among 5- to 6-Year-Old Children: A Cross-Sectional Mediation Analysis To Inform Potential Behavior Change Strategies. Child Obes. 2015;11(2):139–47.
32. Birken CS, Maguire J, Mekky M, Manlhiot C, Beck CE, Jacobson S, Peer M, Taylor C, McCrindle BW, Parkin PC. Parental factors associated with screen time in pre-school children in primary-care practice: a TARGet Kids! study. Public Health Nutr. 2011;14(12):2134–8.
33. Carson V, Clark M, Berry T, Holt N, Latimer-Cheung A. A qualitative examination of the perceptions of parents on the Canadian Sedentary Behaviour Guidelines for the early years. Int J Behav Nutr Phys Act. 2014;11(1):65.
34. De Decker E, De Craemer M, De Bourdeaudhuij I, Wijndaele K, Duvinage K, Koletzko B, Grammatikaki E, Iotova V, Usheva N, Fernandez-Alvira J, et al. Influencing factors of screen time in preschool children: an exploration of parents' perceptions through focus groups in six European countries. Obes Rev. 2012;13 Suppl 1:75–84.
35. He M, Irwin J, Sangster Bouck L, Tucker P, Pollett G. Screen-viewing behaviors among preschoolers parents' perceptions. Am J Prev Med. 2005;29(2):120–5.
36. Hesketh K, Hinkley T, Campbell K. Children's physical activity and screen time: qualitative comparison of views of parents of infants and preschool children. Int J Behav Nutr Phys Act. 2012;9:152.
37. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77–101.
38. Ritchie Jane SL. Qualitative Data Analysis for Applied Policy Research. The Qualitative Researcher's Companion. SAGE Publications, Inc. Thousand Oaks: SAGE Publications, Inc; 2002.
39. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. Acad Med. 2014; 89(9):1245–51.
40. 8 Great iPad Apps for Preschoolers. [http://www.education.com/slideshow/ipad-apps-preschool]. Accessed May 2015.
41. Top educational apps. [http://www.netmums.com/activities/g/top-ten-educational-apps]. Accessed May 2015.
42. Flewitt R, Messer D, Kucirkova N. New directions for early literacy in a digital age: The iPad. J Early Child Literacy. 2014;15(3): 289–310.
43. Neumann MM. An examination of touch screen tablets and emergent literacy in Australian pre-school children. Aust J Educ. 2014;58(2):109–22.
44. Radesky JS, Kistin CJ, Zuckerman B, Nitzberg K, Gross J, Kaplan-Sanoff M, Augustyn M, Silverstein M. Patterns of Mobile Device Use by Caregivers and Children During Meals in Fast Food Restaurants. Pediatrics. 2014. peds.2013–3703. doi:10.1542/peds.2013-3703.
45. Evans CA, Jordan AB, Horner J. Only two hours?: a qualitative study of the challenges parents perceive in restricting child television time. J Fam Issues. 2011;32(9):1223–44.